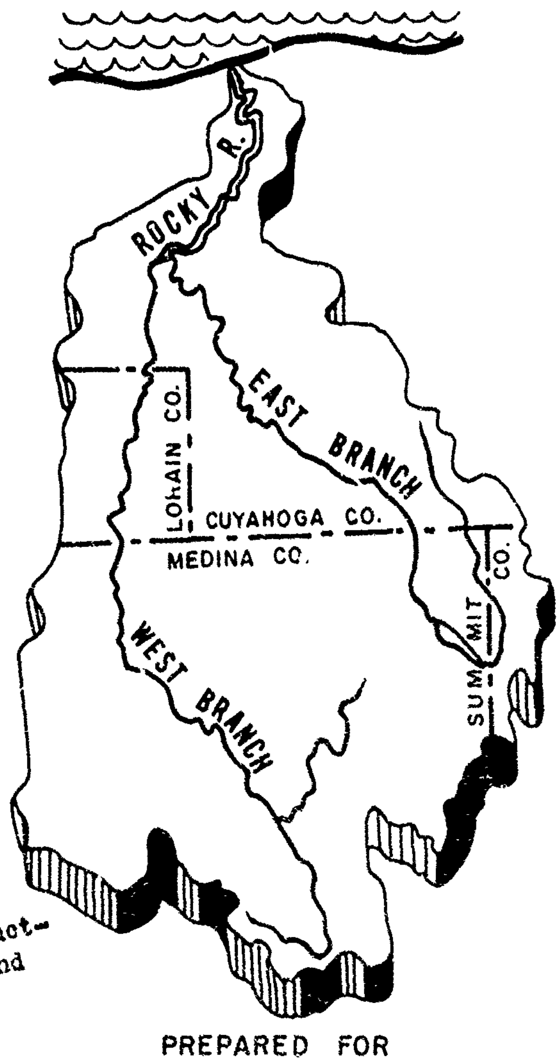
FLOOD PLAIN INFORMATION

WEST BRANCH ROCKY RIVER

CUYAHOGA AND LORAIN COUNTIES OHIO



PREPARED FOR

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER
REGIONAL PLANNING COMMISSION, CUYAHOGA COUNTY
LORAIN COUNTY REGIONAL PLANNING COMMISSION

BY

CORPS OF ENGINEERS, U.S. ARMY
BUFFALO DISTRICT
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This flood information study covers 14 miles of inundated areas along the West Branch of Rocky River from its confluence with the East Branch to the Lorain-Medina County line. WITHIN THE STUDY AREA, THE STREAM FLOWS through the city of North Olmsted, the township of Omsted, and the villages of Olmsted Falls and WestView in Cuyaoga COunty and te township of Columbia in Lorain County. The objective of this reprot is that the data contained here in will be used as a guide by the planners and local officials for effective and

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered) workable legislation for the control of land use within the flood plain.

This reprot is based on hydrological facts, histroical and recent flood heights, and technical date having a bearing on the occurrence and magnitude of floods within the study area.

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INTRODUCTION

In many areas of the country the prospect of using protective works to effectively alleviate possible flood damages has reached the point of diminishing returns. In spite of great expenditures on flood control the increase in flood damage potential is greater than it ever was. As a result, the Flood Plain Management Services Program was developed within the Corps of Engineers to provide local governments with a better understanding of their flood problems and their effect on future growth and development. This program is available to provide flood hazard information that may be used in land use regulations for guiding community growth.

The increase in flood damages has been the result of rapid growth of flood damageable developments in the flood plain, which has been occurring at a rate greater than that of providing flood control works. Flood damages have affected man's environment significantly. They have threatened his life and health, his property, his business and his place of employment. An obvious solution to this problem is to exercise greater wisdom in the use of flood plains. However, such wisdom cannot be exercised unless there is adequate knowledge of the flood hazard and a will on the part of the users of the flood plains to plan with the hazard in mind. Effective, sound land use in floodable areas through the use of regulatory powers has not been used extensively until recent years but is now receiving greater acceptance. It is now time to accelerate and enforce sound land use regulations in order to reduce future flood damages. Because man is powerfully attracted to the use of flood plain areas, Flood Plain Management practices are not likely to eliminate flood damages completely but certainly can reduce them and should be given greater consideration by both planners and local governments.

This flood plain information report on the West Branch of the Rocky River from its confluence with the East Branch to the Lorain-Medina County line has been prepared at the request of the Ohio Department of Natural Resources, the Cuyahoga County Regional Planning Commission, and the Lorain County Regional Planning Commission. It will be distributed to local interests through all of the above agencies.

The objective of this report is that the data contained herein will be used as a guide by the planners and local officials for effective and workable legislation for the control of land use within the flood plain. In order that this objective may be obtained this report is intended to provide planners and local governments with technical information on the largest known floods of the past and to present data on possible future floods, such as, the Intermediate Regional Flood and the Standard Project Flood. The Intermediate Regional Flood has a frequency of occurrence in the order of once in 100 years, which means that over a long period of say 500 years, the magnitude of this flood would probably be equalled or exceeded five times, or on the average of once every 100 years. A flood of this magnitude is simply defined as having a one percent chance of being equalled or exceeded in any given year. The Standard Project Flood is a flood of very rare occurrence and, on most streams in Ohio, is larger than any flood that has occurred in the past. The area referred to as a flood plain in this report is the area that would be inundated by the Standard Project Flood. The frequency of occurrence of the Standard Project Flood is more rare than once in 350 years. However, it is recommended that when valuable development is planned within the flood plain, consideration be given to the levels of possible future floods, including the Standard Project Flood.

This report is based on hydrological facts, historical and recent flood heights, and technical data having a bearing on the occurrence and magnitude of floods within the study area.

Included in this report are maps, profiles, photographs, and cross sections which indicate the extent of flooding that has been experienced and that which might occur in the future. These data, if properly used, can be very beneficial in wise flood plain management. From the maps, profiles, and cross sections in this report the depth of probable flooding at any location may be determined which would result from a recurrence of one of the past floods or by the future occurrence of either the Intermediate Regional Flood or the Standard Project Flood. Based on this information, future construction may be planned high enough to avoid flood damages or, if at lower elevations, with recognition of the chances and hazards of flooding. In either case, the risks involved and the alternatives available should be considered.

This report does not include plans for the solution of flood problems. It is intended to provide the basis for further study and planning on the part of local governments within the study area in arriving at solutions to minimize future flood damages. This can be accomplished by local planning programs which guide essential developments by controlling the type of use made of the flood plain through zoning, building codes, health regulations and other regulatory methods. Another means in which local flood plain management can be accomplished is through public acquisition of land for a low flood damage use such as recreation.

Pamphlets and guides pertaining to flood plain regulations, flood proofing, and other related actions have been prepared by the Corps of Engineers. They are made available to State agencies, local governments and citizens in planning and taking action to reduce their flood damage potential.

The Buffalo District of the Corps of Engineers will, upon request, provide technical assistance to Federal, State and local agencies in the interpretation and use of the information contained within this report and will provide other available flood data related thereto. Information available includes high water mark elevations, bench marks, and sample flood plain regulations. Requests for technical assistance should be coordinated through the Ohio Department of Natural Resources, Division of Water, 815 Ohio Departments Building, 65 South Front Street, Columbus, Ohio 43215.

SUMMARY OF FLOOD SITUATION

This flood information study covers 14 miles of inundated areas along the West Branch of the Rocky River from its confluence with the East Branch to the Lorain - Medina County line. Within the study area, the stream flows through the city of North Olmsted, the township of Olmsted, and the villages of Olmsted Falls and West View in Cuyahoga County and the township of Columbia in Lorain County. The study area is shown on plate I.

There is a discharge measuring station just downstream of the confluence of the East and West Branches, three miles northwest of the city of Berea. Records published by the United States Geological Survey are available for this station from October 1923 to September 1935 and from September 1943 to the present.

To supplement the data obtained from the gage records, local government officials and residents along the stream were interviewed to determine high water marks from past floods. Newspaper files and historical documents were searched for additional information concerning past floods. From these data and studies of possible future floods, the flood situation in the study area, both past and future, has been developed and is summarized in the following paragraphs.

HISTORICAL FLOODS - Historical documents show that there was severe flooding in March 1913 and on 29 June 1924. A maximum known stage of 20.9 feet at the Berea gage occurred in March 1913. On 29 June 1924 the stage at the gage reached 18.6 feet. This flood was a result of a tornado.

THE GREATEST FLOOD - The greatest flood known to have occurred on the West Branch of the Rocky River within the study area during recent years was on 22 January 1959. Its peak flow of 21,400 cfs at the Berea gage has a frequency of occurrence, based on existing development, in the order of once in 70 years.

OTHER GREAT FLOODS - The following dates have been recorded in newspaper articles and Corps of Engineers files as additional occurrences of high water and damage in the study area within recent years: 7 August 1935, 3 June 1947, 27 January 1952, and 10 February 1959.

INTERMEDIATE REGIONAL FLOOD - The Intermediate Regional Flood is a flood that has an average frequency of occurrence in the order of once in 100 years. From an analysis of past floods and as shown on plates 7 through 9 and table 1, it is estimated that this flood is from 0.2 foot to 1.1 feet higher than the elevations of the January 1959 flood.

STANDARD PROJECT FLOOD - The Standard Project Flood is a flood produced by the most severe combination of meteorological and hydrological conditions that is considered reasonably characteristic of the drainage basin under study. The elevation obtained from a flood of this magnitude is considered by the Corps of Engineers to be the upper limit of the flood plain.

FLOOD DAMAGES - The recurrence of major known floods such as the 1913, 1924, and 1959 floods would result in substantial damage in the study area. An occurrence of the Intermediate Regional Flood or Standard Project Flood in the study area would cause extensive damage within the flood plain because of greater depths of flooding and accompanying higher velocities.

MAIN FLOOD SEASON - The major damaging floods have often been caused by melting snow coincident with moderate amounts of precipitation. Although damaging floods have and can occur at any time of the year, almost all instances of major floods have occurred in the late winter or early spring (January - April). Relatively few damaging floods have been produced by precipitation alone.

FLOOD DAMAGE PREVENTION MEASURES - There are no existing or authorized flood control projects within the study area. At the present time only the town of Columbia has flood plain regulations. This report provides detailed information on which the town of Columbia can strengthen their regulations. This information will aid the remaining communities in the study area in establishing flood plain regulations.

POSSIBLE FLOOD HEIGHTS - Flood levels that would be reached by the Intermediate Regional and Standard Project Floods are shown on table I. The table gives the comparison of these flood crests with the January 1959 flood at selected sites along the West Branch. The water surface profiles for the January 1959 flood, the Intermediate Regional Flood and the Standard Project Flood are shown on plates 7 through 9.

VELOCITIES OF WATER - During periods of high water, average channel velocities vary from about four to eight feet per second throughout the study area. During an Intermediate Regional or Standard Project Flood, velocities would be somewhat greater. Velocities greater than three feet per second combined with depths of three feet or greater are generally considered hazardous and dangerous to life and property.

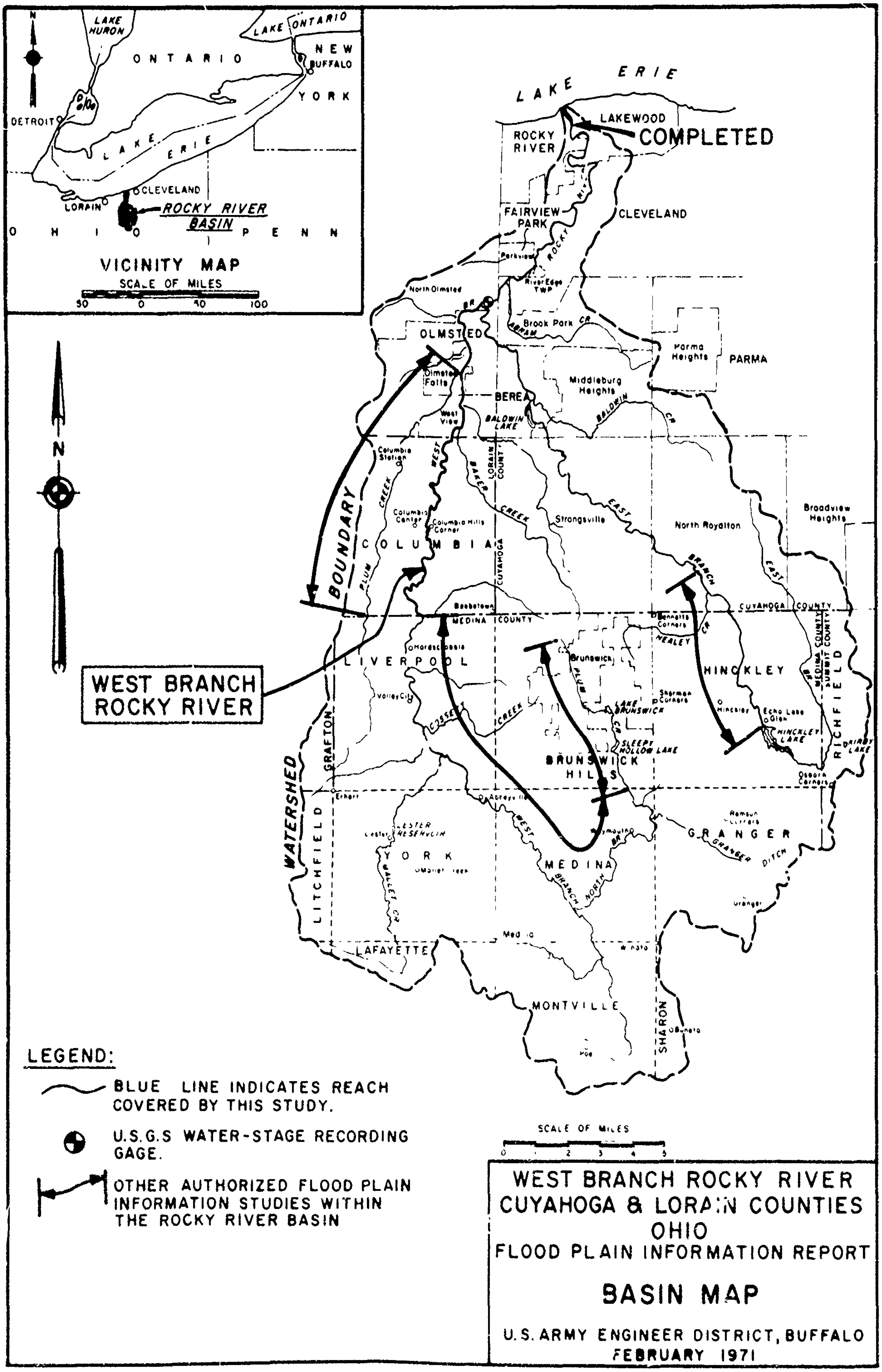
HAZARDOUS CONDITIONS - The larger floods can cause hazards to local residents in many ways. Since most of the floods occur in the late winter and/or early spring, residents caught within the flood suffer illness and discomfort from lack of heat for a number of days due to basement flooding which extinguishes furnace fires. Due to the duration and extent of flooding, health problems can develop when septic tanks are inundated; and high water backs up sewer lines into basements. Municipal sewage treatment plants are often taxed beyond their capacities. Untreated discharge to floodways is made with consequent deposition of waste materials on stream banks and surrounding grounds. Flood waters which overtop roads can cause hazardous driving conditions. In March 1964 a compact car was engulfed by onrushing water as it attempred to cross a ford in Rocky River in North Olmsted. The danger from underestimating the velocity and depth of flood waters by unsuspecting children is an age old problem confronting residents within the flooded area.

TABLE 1

RELATIVE FLOOD HEIGHTS

Location	Mile Above Mouth	Flood	Estimated Peak Discharge (cfs)	Above 1959 Flood(1) (feet)
U.S.G.S. Gage near Berea (Downstream end of study)	12.4	January 1959	21,400	0
		Intermediate Regional	22,900	1.1
		Standard Project	71,200	9.6
Upstream of East Branch junction	12.45	January 1959	16,500	0
		Intermediate Regional	17,500	0.9
		Standard Project	55,300	8.9
Upstream of Plum Creek junction	15.55	January 1959	14,800	0
		Intermediate Regional	15,600	0.4
		Standard Project	49,100	11.8
Upstream of Baker Creek junction	17.55	January 1959	13,900	0
		Intermediate Regional	14,700	0.5
		Standard Project	45,700	12.5
Lorain-Medina County line (Upstream end of study)	26.4	January 1959	12,900	0
		Intermediate Regional	13,600	0.3
		Standard Project	42,400	8.4

(1) Based on free flow conditions for the January 1959 discharge.



WEST BRANCH ROCKY RIVER
CUYAHOGA & LORAIN COUNTIES
OHIO
FLOOD PLAIN INFORMATION REPORT

BASIN MAP

U.S. ARMY ENGINEER DISTRICT, BUFFALO
FEBRUARY 1971

PLATE I

GENERAL CONDITIONS AND PAST FLOODS

GENERAL

This section of the report is a history of past floods on the West Branch of the Rocky River in Cuyahoga and Lorain Counties, Ohio. The study area extends upstream approximately 11 miles from the confluence of the East and West Branches. Plate 1 of this report shows the geographical orientation of Rocky River. The total drainage area is about 293 square miles. The Rocky River basin includes parts of Cuyahoga, Lorain, Medina and Summit Counties.

An investigation of the flood history on Rocky River revealed that flooding has occurred in the past, and damage may increase if action is not taken to regulate future development.

Flood data given in this report are based on reconnaissance investigations made by Buffalo District personnel. During the survey local residents and officials were interviewed, and information was gathered pertaining to water elevations for damages suffered in the past. A search was also made of newspaper files, historical documents, gage records and other miscellaneous sources enabling a history of known floods to be developed for the area being studied.

THE STREAM AND ITS VALLEY - Rocky River drains an area in northern Ohio and consists of two branches, the East Branch rising in North Royalton in southern Cuyahoga County, flowing southerly, northwesterly and northeasterly to Lake Erie, and the West Branch rising in Medina County and flowing northerly to join the East Branch about 12 miles above the mouth. In their upper reaches the two branches flow with moderate slopes in broad valleys. As they approach, they drop in a series of cascades into deep narrow gorges. The West Branch has a number of falls and rapids in the vicinity of Olmsted Falls. Below their confluence, the main river flows through a narrow winding, rock-walled valley, about 100 to 120 feet below the level of the adjacent ground. The width of the valley floor is generally about 300 feet and access is difficult. The river slopes in Olmsted Falls are relatively steep, averaging 60 feet per mile. Upstream of Olmsted Falls, the river slope averages two feet per mile. The river flows into Lake Erie about 6.5 miles west of the main entrance to Cleveland Harbor and about 21.5 miles east of Lorain Harbor. Most of the residential, commercial and industrial development in the study area is located on ground lying above the flood plain. Various channel conditions in the study area are shown on figures 1 through 6. Table 2 shows various drainage areas within the Rocky River Basin.

STREAM GAGING RECORDS - The first record of stages and discharges on Rocky River began in October 1923 with the installation of a chain gage located on the right bank on the downstream side of Cedar Point Road bridge, just downstream from the confluence of the two branches, approximately three miles northwest of the city of Berea. The station records stages resulting from runoff from the 267 square miles of watershed upstream of that point. The discharge rating curve at the Berea gage is well defined for discharge measurements up to 11,000 cfs. During the winter and spring runoff, the stage-discharge relationship has occasionally been affected by ice. The total drainage area of the watershed is 293 square miles so that this gage site measures almost 92 percent of the total river flow. The present measuring equipment is an automatic water-stage recorder, an instrument which produces a graphic representation of the rise and fall of a water surface with respect to time. This recorder has been maintained since September 1943. Prior to 31 August 1929, records are available from a chain gage. From 1 September 1929 to September 1935 a staff gage was maintained at the same location and datum. The advantage of the automatic recorder over a chain gage or staff gage is that both maximum and minimum stages are recorded, the time of their occurrence can be noted, and their corresponding discharges can be determined. Both the chain gage and staff gage can only

Figure 1 - Looking upstream at East Branch of Rocky River from atop Cedar Point Road bridge, North Olmsted, Ohio.

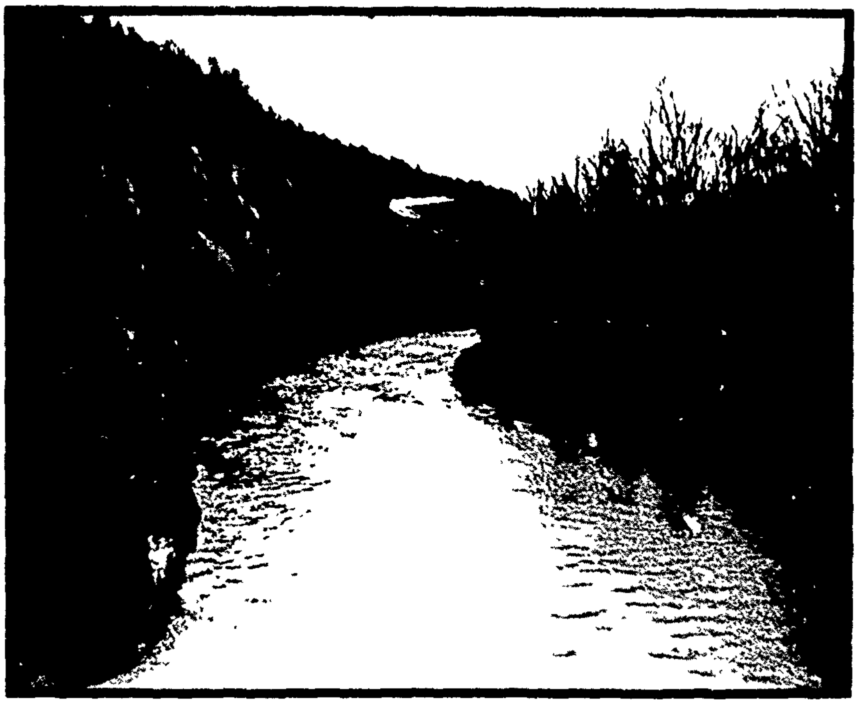


Figure 2 - Looking upstream at West Branch of Rocky River from atop Cedar Point Road bridge, North Olmsted, Ohio, stream mile 12.5. Note steep cliffs in background.

Photos taken March 1970

Figure 3 - Looking upstream from atop Water Street bridge, Olmsted Falls, Ohio, stream mile 15.6. Plum Creek is in background.

Photo taken March 1970

Figure 4 - Looking upstream at dam from atop Sprague Road bridge, Columbia, Ohio, stream mile 17.9.

Photo taken March 1969

Figure 5 - Looking downstream from left bank at stream mile 19.8, Columbia, Ohio. (Note meandering stream).

Figure 6 - Looking downstream from atop Royalton Road bridge, Columbia, Ohio, stream mile 21.9.

Photos taken March 1970

TABLE 2

DRAINAGE AREAS WITHIN THE ROCKY RIVER BASIN

Rocky River	Distance upstream from the mouth	Drainage Area square miles
Main stem at mouth	0.0	293
Main stem upstream of Abram Creek	10.7	268
Main stem at gage	12.4	267
West Branch upstream of East Branch	12.4	190
West Branch upstream of Plum Creek	15.6	161
West Branch upstream of Mallet Creek	34.8	87.4
North Branch upstream of Plum Creek	46.4	15.2
Source	52.5	0.0

indicate the stage at the time of observation. A chain gage is used to determine a stage by lowering a weight to the water surface. The stage is read from a reference bead moving along a horizontal graduated scale. A staff gage provides a visual determination of the water surface by reading a graduated scale anchored permanently in a vertical position within the river channel. Annual reports are published by the United States Geological Survey that furnish the average daily discharges in cubic feet per second, the maximum and minimum instantaneous discharges, and the maximum and minimum elevations. The title of this annual publication "Water Resources Data for Ohio, Part I" is available from the U. S. Geological Survey office in Columbus, Ohio.

SETTLEMENT - Columbia had the honor of being the first settlement in Ohio west of the Cuyahoga River. In the fall of 1807, 33 people from Waterbury, Connecticut bade farewell to their friends and headed for the reported fertile lands of Ohio. On 7 December 1807 Bela Bronson, his wife, and infant son, with 12 men, reached Columbia. The Columbia settlement grew slowly as pioneers continued to come there a few at a time.

In 1814 James Geer, an original settler in Columbia, came to Olmsted Township, built a small log cabin, and became Olmsted's first permanent resident. In the early days the adjoining townships of Olmsted, Middleburg, and Columbia, each five miles square, were dependent on each other. Four years after the arrival of the first settlers, Olmsted and Middleburg were detached from Columbia. In 1822 Olmsted had enough population to apply for its independence of Middleburg. It was decided that there should be an independent township by the name of Lenox. In 1829 the name of Lenox was changed to Olmsted. In the decade 1900 to 1910 very little actual growth or expansion took place. However, there were big improvements in the roads and bridges.

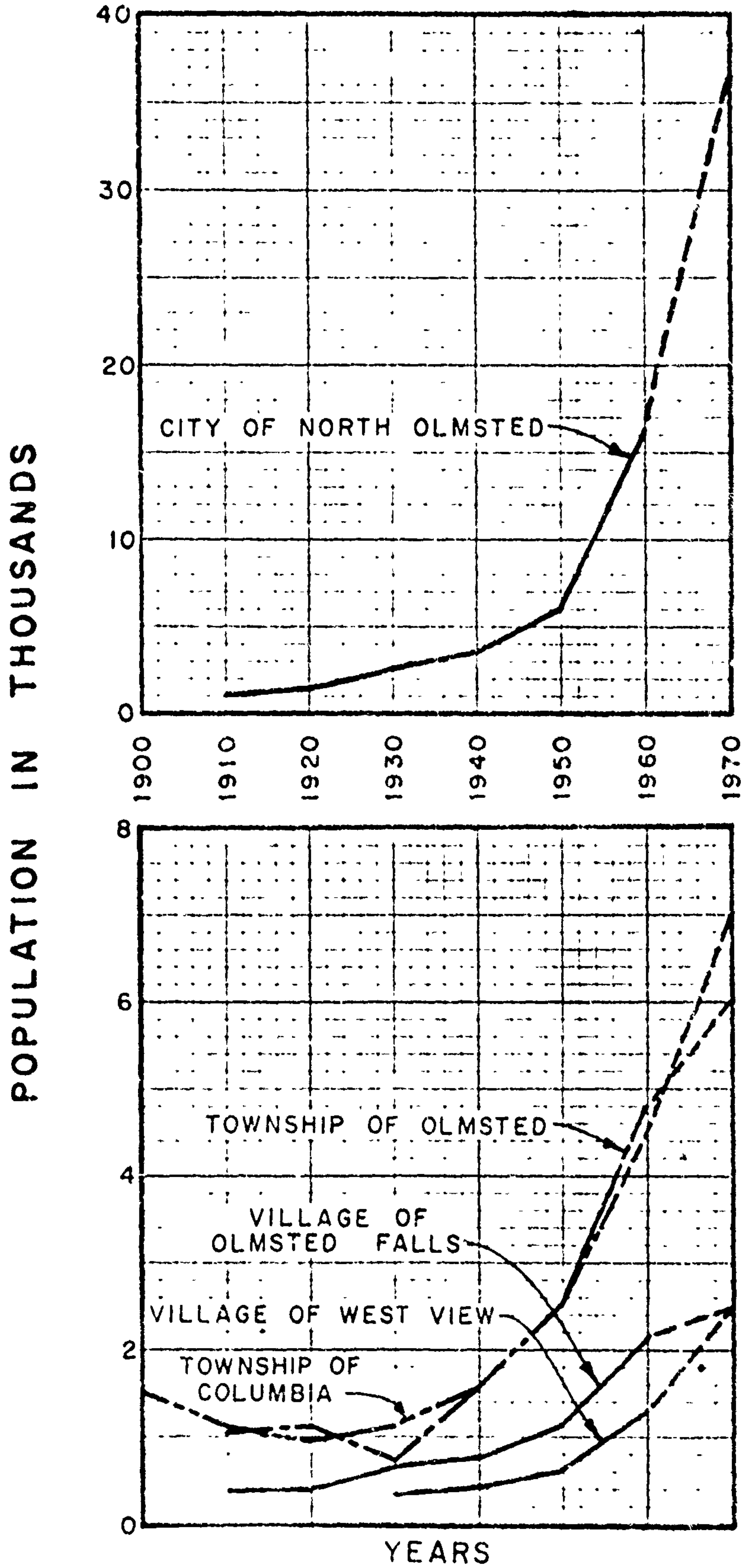
Originally North Olmsted consisted of parts of Olmsted and Dover Townships. Most of the early settlers arrived in Olmsted and Dover between 1815 and 1830. They became mostly farmers with some becoming millers or local merchants. In 1908 the village of North Olmsted was incorporated and in September 1951 became a city. North Olmsted came from a rural agricultural community to a village and now is one of the largest cities in Cuyahoga County.

POPULATION - Figure 7 illustrates the population trends for the individual communities in the study area. Much of the study area is still available for development and is expected to receive a large amount of new housing and population growth over the next ten years. Single-family dwellings overwhelmingly dominate the housing in the area.

DEVELOPMENT IN FLOOD PLAIN - In Columbia in 1900 quarry operations were at their height; and carloads of grindstones and building blocks were sent out from three quarries. The first of the big greenhouses was built in 1922, and Columbia became the greenhouse center. Their existence lightened the effects of the depression. Steer fattening and the growing of potatoes, grain, vegetables, and flowers are other examples of diversified agriculture in Columbia today.

Wildwood Lake is used for picknicking and swimming. The valley of the West Branch in Olmsted, Olmsted Falls, and West View is relatively narrow and contains only scattered development. In areas of scattered development only a few of the lowest-lying homes are affected. In Olmsted there are approximately 15 homes on Rainbow Drive within the flood plain. The Rocky River basin has in recent years experienced suburban development as a result of westward expansion of the Cleveland metropolitan area.

This report provides the local communities, within the study area, with data that can be incorporated into effective flood plain regulations. Using this data the local communities can determine what use



POPULATION TRENDS

FIGURE 7

and type of development should be placed in the flood plain. The use of the flood plain and its development should be determined through consideration of the frequency and depths of possible future floods.

Figures 8 through 15 are examples of development in the flood plain.

EXISTING REGULATIONS - In 1967 Columbia established a flood plain district for the purpose of protecting the public and encouraging the establishment of recreational facilities in the flood plain. It was created for those areas along Rocky River which were flooded in January 1959. In the flood plain district agricultural uses are permitted; and commercial, public, and private park and recreation facilities may be erected. Other communities within the study area do not have specific provisions to regulate building within the flood plain or to regulate the use of land with respect to flood risk. Such regulations may be made possible by counties, municipalities, and townships under their regular zoning and building code statutes. Samples of flood plain regulations passed in communities throughout the country are available at the Buffalo District office.

This report provides the town of Columbia with information, in greater detail, on which to base their regulations.

In the State of Ohio, the power to adopt and enforce zoning regulations is delegated to political subdivisions. The enabling statutes are sections 303.02, 519.02 and 713.07 of the revised code. The General Assembly of the State of Ohio has passed an amendment to House Bill No. 314 that states, all departments and agencies of the State shall notify and furnish to the Division of Water information on State facilities which may be affected by flooding. This information is required in order to avoid the uneconomical, hazardous, or unnecessary use of flood plains in connection with State facilities. The amendment further reads that where economically feasible, departments and agencies of the State and political subdivisions responsible

Figure 8 - Typical residence along Rainbow Drive, stream mile 13.0. The January 1959 flood inundated Rainbow Drive.

Figure 9 - Typical residence along Metropolitan Drive in village of Olmsted Falls, stream mile 16.2. The Standard Project Flood would affect some residences along Metropolitan Drive.

Photos taken March 1970

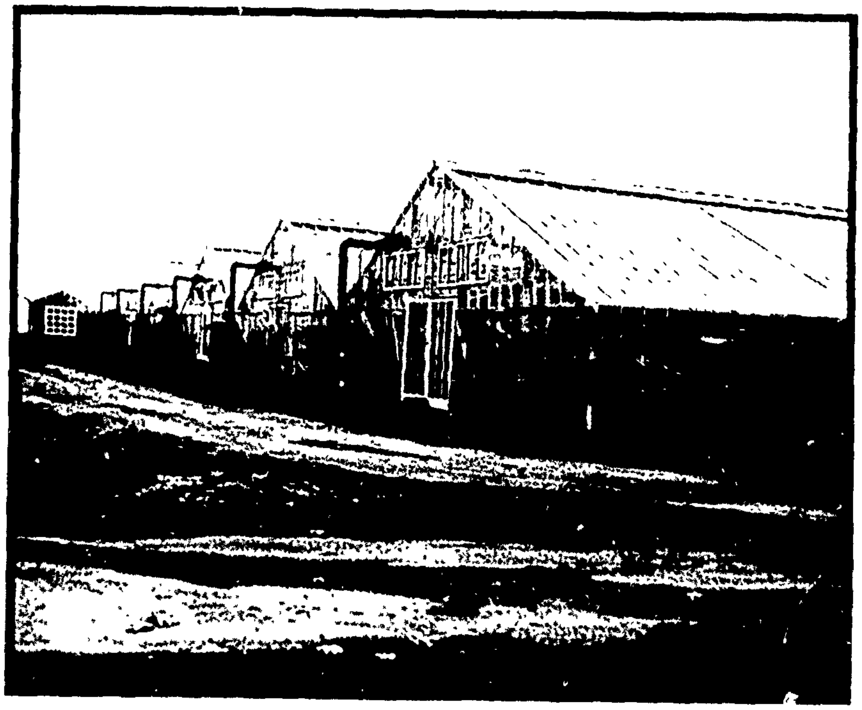


Figure 10 - Typical greenhouse in village of West View, stream mile 17.5.

Figure 11 - Agricultural field in Columbia, stream mile 22.6.

Photos taken March 1970

Figure 12 - Cleveland Metropolitan Park, stream mile 12.4. Wise flood plain use.

Figure 13 - Newly constructed house at confluence of Baker Creek and the West Branch of Rocky River, stream mile 17.6. Poor flood plain use.

Photos taken March 1970

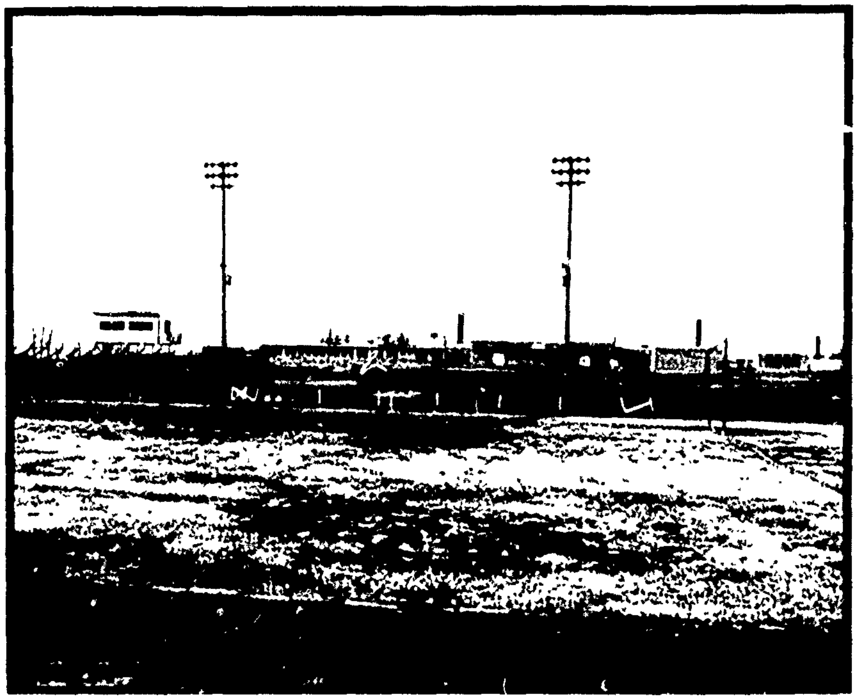


Figure 14 - Athletic field at Columbia High School, stream mile 21.9.

Figure 15 - Columbia Hills Golf Club, stream mile 23.7.

Wise flood plain use.
Photos taken March 1970

for existing publicly owned facilities shall apply flood proofing measures in order to reduce potential flood damage. Under Executive Order 11296, the Federal Government has similar restrictions in that all executive agencies directly responsible for the construction of Federal facilities shall evaluate flood hazards when planning the location of new facilities. In addition, this order requires that executive agencies responsible for the administration of Federal grant, loan or mortgage insurance programs shall evaluate flood hazards in order to minimize potential flood damage and the need for future Federal expenditures for flood protection and flood disaster relief.

FLOOD WARNING AND FORECASTING SERVICES - At present there are no specific flood warning or forecasting services for the Rocky River basin. The study area, however, is well within the effective range of the Weather Surveillance Radar which is operated continuously by the U. S. Weather Bureau at the Cleveland and Akron-Canton Airport Stations. This equipment provides for the early detection and plotting of heavy precipitation and makes possible immediate radio and television broadcasts of information concerning the predicted path and amount of rainfall from the storm.

BRIDGES - There are 8 highway bridges, 3 foot bridges and 2 railroad bridges in the reach covered by this study. Table 3 lists pertinent data for these structures and shows the relation of the Intermediate Regional Flood and Standard Project Flood to the January 1959 flood, the most damaging of record.

Water surface profiles are shown on plates 7 through 9 and should be helpful to local officials in any future construction of new bridges or alterations to existing bridges. At any new bridges there should be sufficient clearance for drift and debris which usually accompany high water. The profiles shown on plates 7 through 9 show which existing bridge openings are constrictive.

TABLE 3

BRIDGES ACROSS WEST BRANCH OF THE ROCKY RIVER IN STUDY AREA

Station (In Miles)	Identification	Stream bed Elevation	Jan 1959 Flood Crest Elev (1)	Intermediate Regional Flood Crest Elev (1)	Standard Project Flood Crest Elev (1)	Avg Floor Elevation	Under-clearance-avg. Low Steel Elevation
12.41	Cedar Point Rd.	645.6	664.9	665.9	673.8	670.5	666.8
12.84	Lewis Rd.	653.5	670.5	670.8	678.4	673.7	671.1
15.52	Water St.	690.4	703.8	704.2	715.6	735.7	729.5
15.78	Penn-Central Trans Co	703.8	717.1	717.5	730.4	770.0	757.0
16.00	Bagley Rd.	716.9	731.0	731.4	746.7	750.5	746.6
16.94	Penn-Central Trans Co	727.7	747.5	748.1	761.8	776.4	760.9
17.17	Ohio Turnpike*	731.1	750.4	751.0	763.9	766.2	761.0
17.88	Sprague Rd.	737.1	756.1	756.6	767.7	762.9	758.7
21.85	Royalton Rd.	753.2	775.9	776.3	785.2	778.3	773.9
23.59	Foot	759.6	779.8	780.1	787.4	782.2	779.8
23.66	Vehicular	759.3	780.0	780.2	787.5	764.3	762.0
23.78	Foot	758.5	780.6	780.8	788.0	779.0	776.8
24.07	Foot	759.0	781.1	781.3	788.3	781.0	778.9

NOTE: All elevations are referred to U.S.C. & G.S. datum.

* High level bridge

(1) All elevations refer to upstream side of respective bridge.

On figures 16 through 19 are photographs of some of the bridges in the study area.

<u>OBSTRUCTIONS TO FLOOD FLOWS</u> - Inadequate bridge areas, abandoned dams, encroachments, and fills are some of the obstructions to flood flows. Other serious obstructions are bends in the stream, irregularity of channel section, and heavy brush, weeds, and large trees growing on the channel banks and extending into the stream. Figures 20 through 22 show obstructions which tend to reduce floodway capacity and increase river stages.

To keep obstructions to flows at a minimum each community should establish maintenance programs for streams within their area. For example, highway crews during slack periods could remove fallen trees, shoals and debris that may have collected in the channel. A concentrated effort should be made by the people not to throw refuse or other matter into the streams. The local government should establish a floodway, which is a strip of land on either side of the river that is kept free of obstructions that would interfere with flows. Flood flows have come in the past and they will come again. A floodway provides room for flood flows when they come.

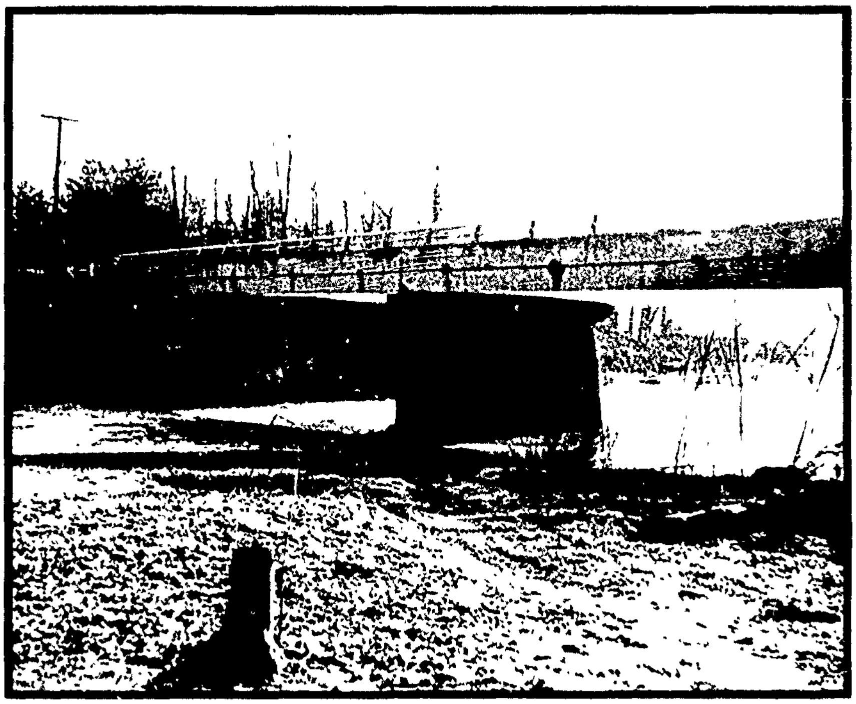


Figure 16 - Upstream face of Lewis Road bridge,
stream mile 12.8.

Figure 17 - Upstream face of Water Street bridge,
stream mile 15.5

Bridges in study area
Photos taken March 1970

Figure 18 - Downstream face of Royalton Road bridge, stream mile 21.9.

Figure 19 - Upstream face of foot bridge at Columbia Hills Golf Club, stream mile 24.1.

Bridges in study area
Photos taken March 1969

Figure 20 - Upstream face of Penn Central Transportation Company bridge, stream mile 16.9. Note skew of bridge.

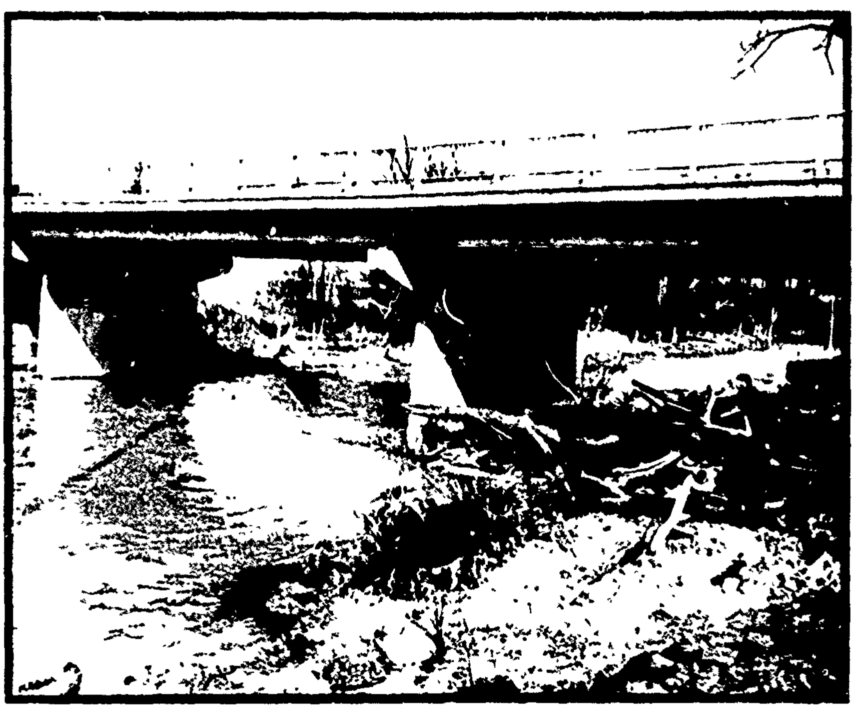


Figure 21 - Upstream face of Sprague Road bridge, stream mile 17.9. Note amount of debris collecting near right abutment.

Obstructions to flow
Photos taken March 1970

Figure 22 - Looking upstream at stream mile 18.4 from right bank. Note dumping area and encroachment.

Obstructions to flow
Photo taken March 1970

FLOOD SITUATION

FLOOD STAGES AND DISCHARGES - Table 4 lists flood crests and peak discharges for the known floods exceeding bankfull stage of 7.5 feet at the gaging station. A discharge of approximately 8,200 cfs will produce a stage of 7.5 feet at the gage.

Table 5 lists the highest ten known floods at the gage. Plate 2 shows known crest stages and years of occurrence of floods since 1913 which have exceeded the bankfull stage of 7.5 feet on Rocky River near Berea.

TABLE 4

FLOODS ABOVE BANKFULL STAGE

ROCKY RIVER NEAR BEREA, OHIO

Date of Crest	Gage Height Stage feet (1)	Elevation feet (1)	Discharge cfs
March 1913	20.9	670.8	unknown
11 January 1924	7.8	657.7	9,220
29 June 1924	18.6 (2)	668.5	unknown
15 September 1925	7.9	657.8	9,420
25 February 1926	9.6	659.5	13,200
20 March 1927	8.4	658.3	10,300
14 December 1927	10.9	660.8	15,700
19 January 1929	11.4	661.3	16,600
8 January 1930	7.9	657.8	9,420
14 March 1933	8.8	658.7	11,200
7 August 1935	10.8	660.7	15,400
3 June 1947	9.1	659.0	11,900
21 March 1948	8.2	658.1	9,860
16 January 1950	8.7	658.6	11,100
24 April 1950	8.2	658.1	9,860
18 January 1952	7.5	657.4	8,570
27 January 1952	9.0	658.9	11,700
16 October 1954	8.1	658.0	9,660
12 May 1956	8.2	658.1	9,860
22 January 1959	14.1	664.0	21,400
10 February 1959	10.5	660.4	15,000
26 April 1961	8.2	658.1	9,950
6 March 1964	7.7	657.6	9,020
6 July 1969	8.3	658.2	10,000

(1) Based on latest U.S.G.S. stage-discharge relationship records.

(2) Stage resulting from a tornado.

TABLE 5

HIGHEST TEN KNOWN FLOODS IN ORDER OF MAGNITUDE

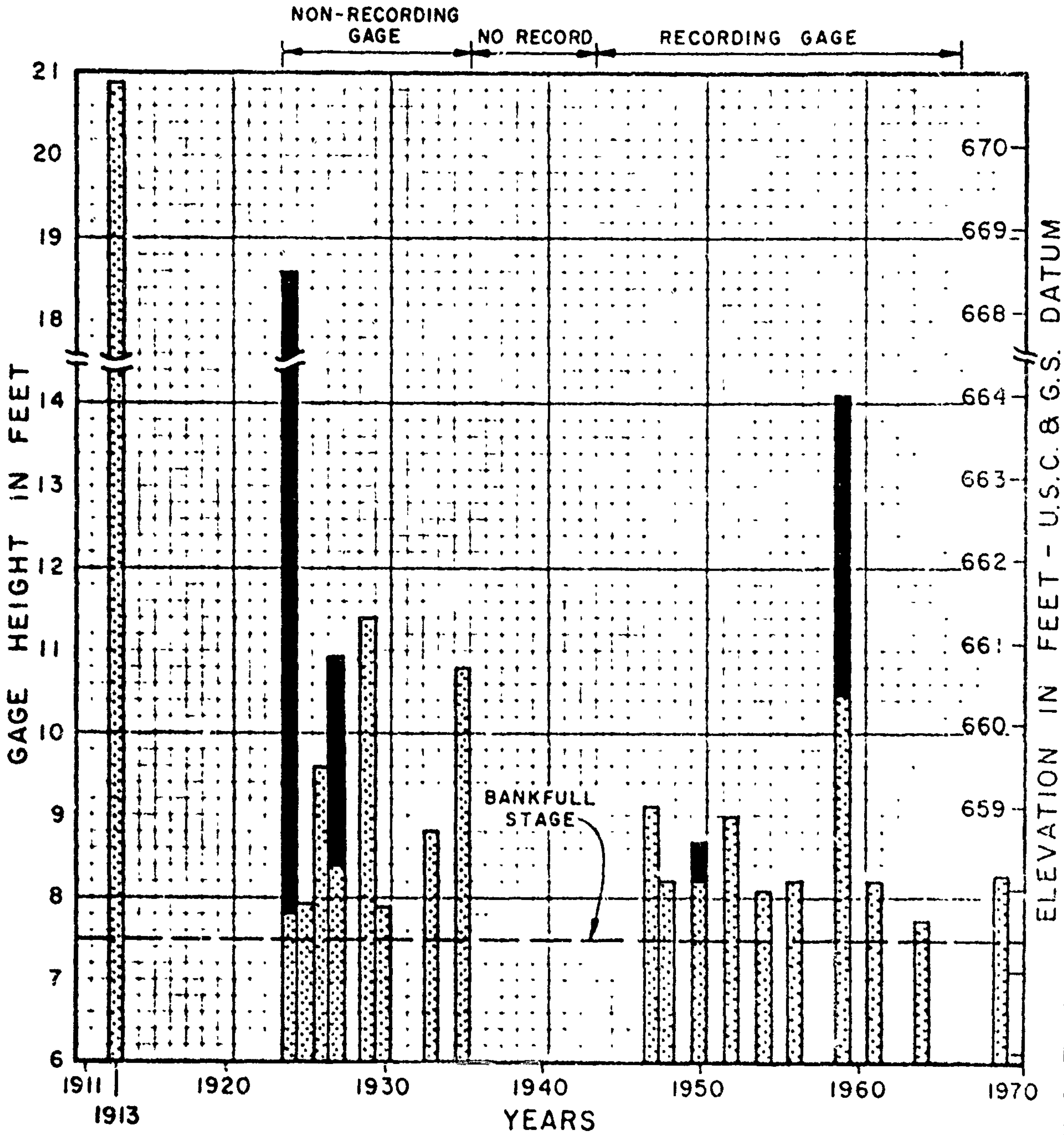
ROCKY RIVER AT U.S.G.S. GAGING STATION

BEREA, OHIO

Order No.	Date of Crest	Gage Height Stage feet (1)	Gage Height Elevation feet (1)	Estimated Peak discharge
1	March 1913	20.9	670.8	unknown
2	29 June 1924	18.6 (2)	668.5	unknown
3	22 January 1959	14.1	664.0	21,400
4	19 January 1929	11.4	661.3	16,600
5	14 December 1927	10.9	660.8	15,700
6	7 August 1935	10.8	660.7	15,400
7	10 February 1959	10.5	660.4	15,000
8	25 February 1926	9.6	659.5	13,200
9	3 June 1947	9.1	659.0	11,900
10	27 January 1952	9.0	658.9	11,700

(1) Based on the latest U.S.G.S. stage-discharge relationship.

(2) Stage caused by a tornado.



ROCKY RIVER NEAR BEREA, OHIO

Stream gage at mile 12.4 - Drainage Area, 267 Sq. Mi.

Zero of gage, El. 649.9 U.S.C. & G.S. Datum

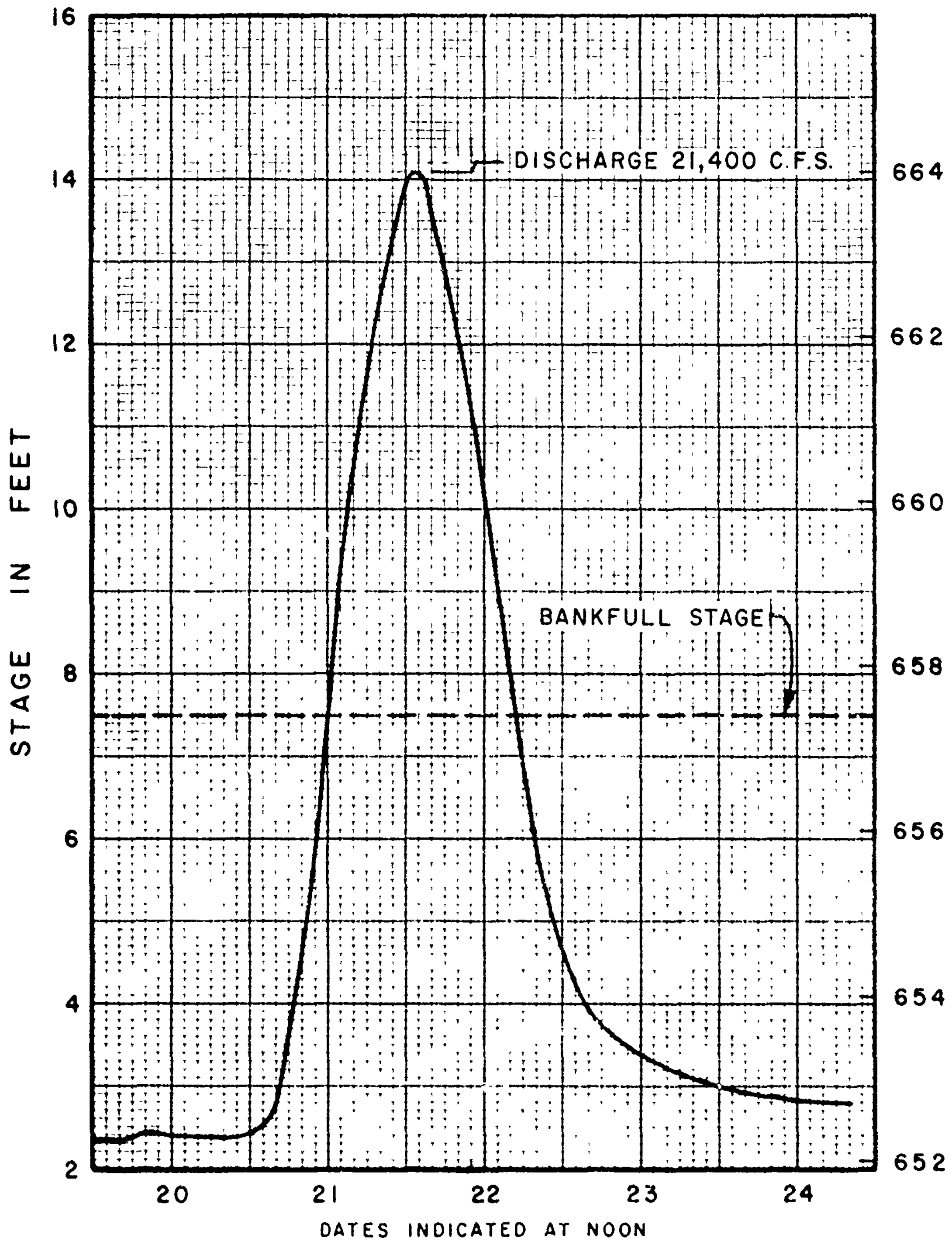
Variation in shading on the bar graph indicates more than one flood during the year.

Stages based on latest U.S.G.S.-Stage discharge relationship.

WEST BRANCH ROCKY RIVER
CUYAHOGA & LORAIN COUNTIES
OHIO
FLOOD PLAIN INFORMATION REPORT

FLOODS ABOVE BANKFULL STAGE

U.S. ARMY ENGINEER DISTRICT, BUFFALO
FEBRUARY 1971



JANUARY 1959

BEREA GAGE, RIVER MILE 12.4

NOTES:

ZERO OF GAGE = EL. 649.9 U.S C. & G S DATUM.

BANKFULL STAGE = 7.5 FEET OR ELEVATION 657.4 U.S.C. & G.S DATUM.

WEST BRANCH ROCKY RIVER
CUYAHOGA & LORAIN COUNTIES
OHIO
FLOOD PLAIN INFORMATION REPORT

STAGE HYDROGRAPH

U.S. ARMY ENGINEER DISTRICT, BUFFALO
FEBRUARY 1971

DURATION AND RATE OF RISE - Plate 3 shows the stage hydrograph of the January 1959 flood at the U.S.G.S. gaging station on Rocky River near Berea. At the gage site during this flood the river rose to its crest in 24 hours at an average rate of rise of 0.50 foot per hour with a maximum rate of one foot in an hour and remained above bankfull (flood) stage for 29 hours.

VELOCITIES - Average channel velocities during floods depend largely upon the size and shape of the channel section, the composition of the surface with which the water is in contact, the condition of the stream, and the slope of the channel bottom. All of these vary on different streams and at different locations on the same stream. Channel velocities for a recurrence of the January 1959 flood in the study area were estimated to be about four to eight feet per second; average velocities in the overbank area were estimated to be three feet per second. During floods of greater magnitude, channel and overbank velocities would be higher and more hazardous to both life and property.

FLOODED AREAS, FLOOD PROFILES AND CROSS SECTIONS - Plates 5 and 6 show the approximate areas along the West Branch of the Rocky River that would be inundated by the Intermediate Regional Flood and the Standard Project Flood. The actual limits of these overflow areas on the ground may vary some from those shown on the map because the contour interval and scale of the map do not permit exact plotting of the flooded area boundaries. These maps show those areas where flood hazards must be considered.

Plates 7 through 9 show the high water profiles for the January 1959 flood, the Intermediate Regional Flood and the Standard Project Flood. The profiles show at what elevation valuable development must be built to avoid flooding.

Plates 10 through 12 show several valley cross sections that are indicative of the terrain within the study area investigated. The location of the sections are shown on plates 5 and 6. The elevation and extent of overflow of the January 1959, Intermediate Regional and Standard Project Floods are indicated on these sections. These cross sections give an indication of the depth of flooding at various locations in the study area.

FLOOD DESCRIPTIONS

Descriptions of known large floods that have occurred in the study area are based on field investigations, historical records and newspaper accounts. The greatest flood of historical record occurred in March 1913. Other major damaging floods occurred sporadically for as long as can be remembered. A condensation of available information on these flood occurrences is given in the following paragraphs. This information is presented as an example of the type and extent of flood problems which have already occurred and as an indication of possible future flood problems.

23-28 MARCH 1913 - The storm, which caused the highest recorded stage at the Berea gage, developed from the stagnation of a tropical marine air mass from the Gulf of Mexico against a cold air mass from Canada. Heavy rains occurred during the periods 13-15 and 20-21 March. These rains were only preliminary to the severe storm which developed during the period of 23-27 March. This storm extended from Texas to Lake Erie with its center over Bellefontaine, Ohio, 125 miles southwest of the Rocky River basin. Two low-pressure centers caused excessive rainfall in Ohio and neighboring states for about 60 hours. Bellefontaine recorded a total of 11.16 inches of rainfall in 92 hours. This disasterous flood ruined Damp's Mills in Olmsted Falls and Thomas Chamber's Mill in West View. It washed out the Water Street and Sprague Road bridges. The 1913 flood is considered to be near Standard Project Flood magnitude. If the 1913 flood occurred today, damages would be severe throughout the study area.

28 JUNE 1924 - The wind and rain storm that broke over the study area on 28 June 1924 was the worst ever witnessed up to that time in this part of the country. Lasting for nearly two hours, the rain submerged the streets and fields and blocked drain sewers and ditches. Winds

twisted and tore trees literally to pieces and in many instances unroofed houses and barns. The rain fell in torrents and by the time the storm had abated, West Cuyahoga County was in chaos. Residents estimated that $100,000 damages were sustained in the flood plain in the comparatively small area between Cedar Point Road and Olmsted Falls.

20-21 JANUARY 1959 - The January 1959 flood caused severe damage not only in the Rocky River basin but throughout the State of Ohio. The storm that contributed to this great flood developed from a large mass of cold air over northwestern Canada, a flow of warmer air from the southwest and the associated frontal system. Heavy rains began on the 20th when the moisture-laden air from the south and a cold front converged. Although total rainfall for the storm was not excessive, intensities were high and runoff was increased by the frozen ground and the six-inch snow cover on the basin. An ice jam at the confluence of the East and West Branches of the Rocky River caused high water on Rainbow Drive, stream mile 12.9. Approximately 15 families had to evacuate their homes. Most of the basements of the homes were flooded. There were no more than 3 inches of water on the first floor on any of the homes. In West View, water backed up into Stein's greenhouses. Several houses of tomatoes had to be replanted. For the first time since the new Royalton Road bridge was constructed, the water was over the west approach to the bridge.

Figures 23 and 24 show flooding conditions in January 1959 and February 1959 in the study area.

This concludes the "General Conditions and Past Floods" section of this report. What can be done to prevent and/or reduce future flood damages?

By using the flooded area maps, flood profiles and cross sections contained in this report as a guide, development, dependent upon the

Figure 23 - Flooding conditions downstream of Sprague Road bridge. Photo taken in January 1959 by Miss Bernice Lusk.

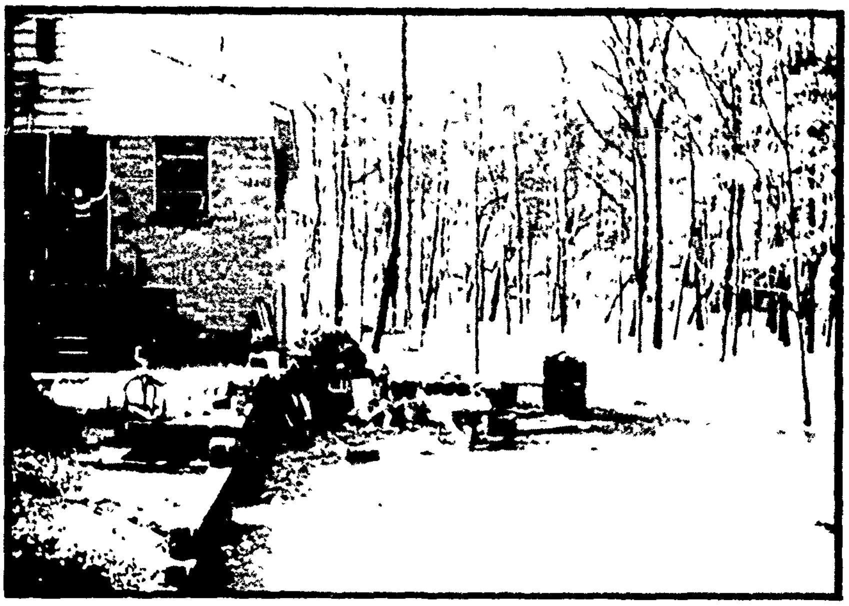


Figure 24 - Flooding conditions along Rainbow Drive, Olmsted Falls. Photo taken in February 1959 by Mrs. Jacob Vilsmeier.

frequency of flooding, can be allowed in the flood plain. The elevation shown on the profiles will enable local citizens to raise developments above flood levels or flood proof their structures in order to reduce potential future flood damages. The elevations shown on the profiles should be used to determine flood heights because they are more accurate than the flooded outlines. Units of low flood damage potential should be stressed during any future development or renewal development in areas which are susceptible to frequent flooding. A permanent floodway should be established. Cleveland Metropolitan Park in the study area is an excellent example of good flood plain use. If future or renewal developments are considered in areas subject to frequent flooding, it may be uneconomical to elevate the land above potential future flood levels. In this situation, means of flood proofing the structures should be undertaken.

Local governments can also develop and enforce as soon as possible flood plain regulations based on the information contained in this report. This would provide them with the necessary legal tools to control any redevelopment to take place within the area without due consideration for the flood hazards. Regulation of the flood plain can usually be carried out most effectively by a combination of the regulatory methods, such as zoning ordinances and building codes. The U. S. Army Corps of Engineers has prepared pamphlets entitled "Guidelines for Reducing Flood Damages" and "Introduction to Flood Proofing", and is distributing them to state, county and local governments for public dissemination. The combination of data presented in this report and the pamphlets will provide general guidelines for flood damage reduction within the Rocky River flood plain. Figure 25 lists the corrective and preventive measures described in the above mentioned pamphlets. The U. S. Army Corps of Engineers will distribute to state, county and local governments other helpful pamphlets as well as additions to existing pamphlets as they are developed.

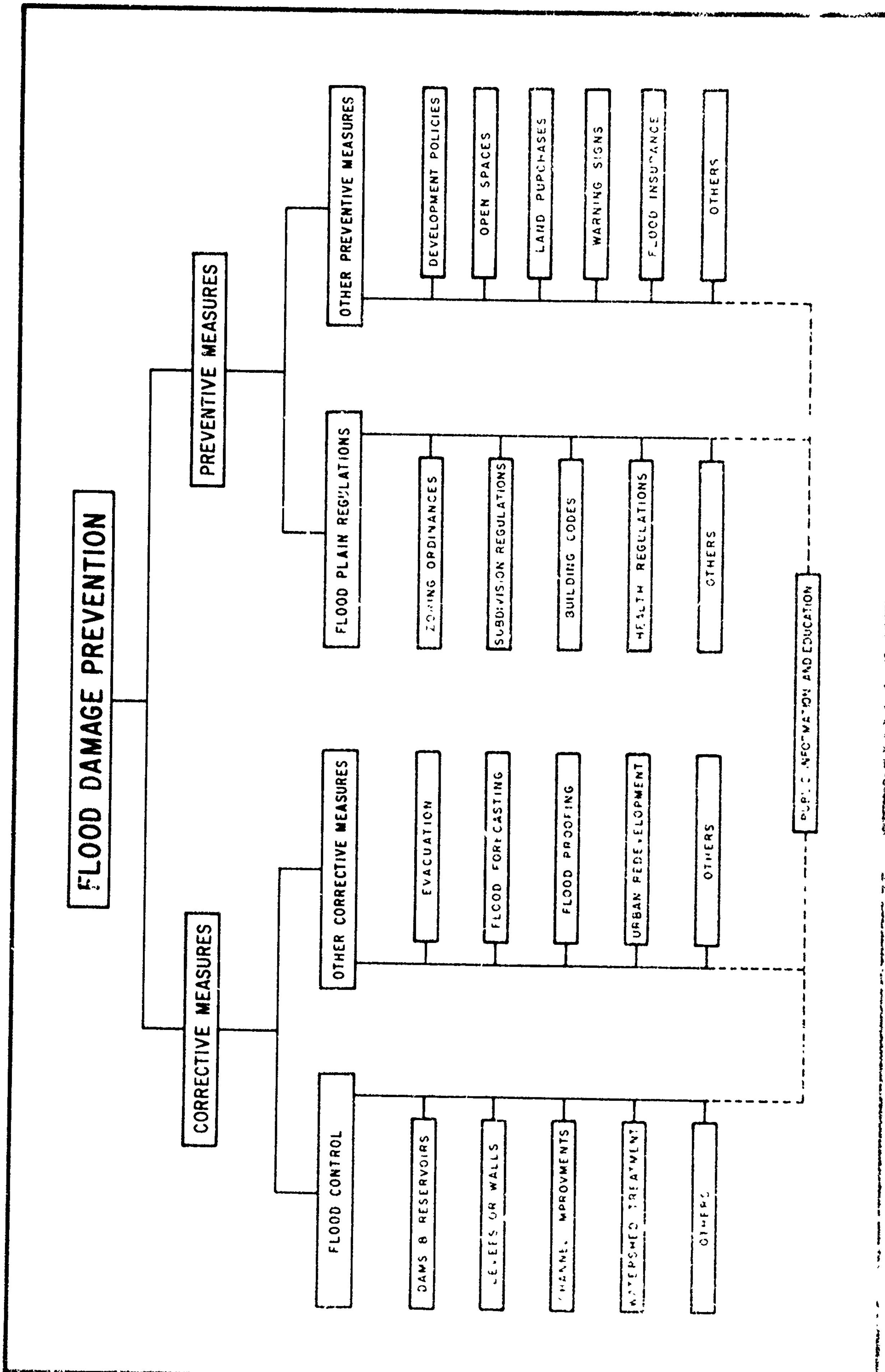

FLOOD DAMAGE PREVENTION
CORRECTIVE MEASURES
PREVENTIVE MEASURES
FLOOD CONTROL
OTHER CORRECTIVE MEASURES
FLOOD PLAIN REGULATIONS
OTHER PREVENTIVE MEASURES
DAMS & RESERVOIRS
LEVEES OR WALLS
CHANNEL IMPROVMENTS
WATERSHED TREATMENT
OTHERS
EVACUATION
FLOOD FORECASTING
FLOOD PROOFING
URBAN REDEVELOPMENT
OTHERS
ZONING ORDINANCES
SUBDIVISION REGULATIONS
BUILDING CODES
HEALTH REGULATIONS
OTHERS
DEVELOPMENT POLICIES
OPEN SPACES
LAND PURCHASES
WARNING SIGNS
FLOOD INSURANCE
OTHERS
PUBLIC INFORMATION AND EDUCATION

FIGURE 25

FUTURE FLOODS

This section of the report discusses the Standard Project Flood and Intermediate Regional Flood on Rocky River.

A Standard Project Flood is a severe flood of infrequent occurrence. It is possible, but unlikely, that a flood of greater magnitude may occur. The Standard Project Flood concept was developed by the U. S. Army Corps of Engineers. It provides an indication of the upper limit of flooding in a particular area and is used by the Corps of Engineers to compare floods in different locations throughout the United States.

Floods the size of the Intermediate Regional represent floods that may reasonably be expected to occur more frequently than the Standard Project Flood.

Large floods have been experienced in the past on streams in the general geographical region of this study. Storms similar to those causing these floods could occur over the Rocky River basin. In this event, floods would result on Rocky River comparable in size to those experienced on neighboring streams. It is therefore desirable to consider floods that have occurred in the region when determining future floods on Rocky River. Table 6 lists the maximum known floods and peak discharges which have occurred at U.S.G.S. gaging stations in the region of this study.

The elevations shown in this report for the Intermediate Regional and Standard Project Floods are realistic and could very well occur in any year. A storm on 4 July 1969, in northern Ohio, produced floods on the Black and Huron Rivers of greater magnitude than the Intermediate Regional Flood for these rivers. In some areas the discharge approached Standard Project Flood magnitude. The 4 July 1969 storm with only a moderate shift eastward could have very well produced a flood along Rocky River greater than the Intermediate

Regional Flood shown in this report. The point emphasized here is that although the Intermediate Regional and Standard Project Floods in this report are higher than floods that have occurred in the past they could possibly occur in the future. To avoid possible damage from floods of Intermediate Regional or Standard Project magnitude, development in the flood plain should not occur without consideration to possible future flood elevations, the risks involved, and possible alternatives.

DETERMINATION OF INTERMEDIATE REGIONAL FLOOD

The Intermediate Regional Flood is defined as a flood having a recurrence interval of once in 100 years at a designated location. However, this flood may occur in any one year or in consecutive years. A statistical analysis of stream flow records available for the basin under study is often used to determine a frequency of occurrence, but limitations in such records usually require analysis of rainfall and runoff characteristics in the "general region" of the area under study. The Intermediate Regional Flood represents a major flood, but it is much less severe than the Standard Project Flood.

Results of the studies indicate that the Intermediate Regional Flood on Rocky River near the Berea gaging station would have a peak discharge of 22,900 cubic feet per second.

DETERMINATION OF STANDARD PROJECT FLOOD

Only in rare instances has a specific stream experienced the largest flood that can be expected to occur. Severe as the maximum known flood may have been on any given stream, it is a commonly accepted fact that sooner or later a larger flood can and probably will occur. The Corps of Engineers, in cooperation with the Weather

TABLE 6

MAXIMUM KNOWN FLOOD DISCHARGES AT U.S.G.S. GAGING STATIONS
IN THE REGION OF ROCKY RIVER, OHIO

Stream	Location Ohio	Period of Record (years)	Drainage area (sq. mi.)	Peak discharge of record: Date	Peak discharge of record: Amount (cfs)	Peak discharge of record: Per square mile	Estimated recurrence interval (years)*
Sandusky River	Fremont (1)	44	1,251	10 Feb 1959	28,000 (2)	22.4	10
Huron River	Milan	20	371	5 July 1969	48,900	131.8	200
Vermilion River	Vermilion	18	262	6 July 1969	40,800	155.7	100
Black River	Elyria	25	396	6 July 1969	51,700	130.6	greater than 200
Cuyahoga River	Old Portage	46	404	21 Jan 1959	6,500	16.1	200
Cuyahoga River	Independence (3)	41	707	22 Jan 1959	21,400 (4)	29.7	100
Chagrin River	Willoughby	40	246	22 Mar 1948	28,000	113.8	60
Rock Creek	Rock Creek	24	69	21 Jan 1959	8,000	115.6	35
Mill Creek	Jefferson	28	82	22 Jan 1959	9,810	119.6	200
Grand River	Madison	45	581	22 Jan 1959	21,100	36.3	100
Ashtabula River	Ashtabula	41	121	22 Jan 1959	11,600	95.9	50
Conneaut Creek	Conneaut	34	175	22 Jan 1959	17,000	97.1	60
Rocky River	Berea	37	267	22 Jan 1959	21,400	80.1	70

* Based on conditions of development at time of flood.

(1) The estimated peak discharge of the maximum flood of record was 63,500 cfs for the 1913 flood. It has an exceedence interval of about 500 years based on a discharge frequency basis and about 200 years on a stage-frequency basis.

(2) Estimated by U.S.G.S.

(3) The estimated peak discharge of the maximum flood of record was 30,000 cfs for the 1913 flood. It has a recurrence interval on the order of once in 200 years.

(4) Estimated by Corps of Engineers.

Bureau, has made broad and comprehensive studies and investigations based on the vast records of past storms and floods and has evolved generalized procedures for estimating the flood potential of streams. These procedures have been used in determining the Standard Project Flood. The Standard Project Flood is defined as the flood that can be expected from the most severe combination of meteorological and hydrological conditions that is considered reasonably characteristic of the geographical region involved. Although the Standard Project Flood has only a rare chance of occurrence, it is not the most severe flood that could occur. The Standard Project Storm rainfall used for Rocky River at the U.S.G.S. gaging station amounts to 4.52 inches in three hours, 9.03 inches in six hours, 11.89 inches in 24 hours, and a total of 14.49 inches in 96 hours. The peak discharge of the Standard Project Flood on Rocky River within the study area is 71,200 cfs. Rainfalls of this magnitude have been recorded in the region. In July 1969 in Wooster, Ohio, 9.37 inches of rain fell in 24 hours, and a total of 10.69 inches fell in 96 hours.

FREQUENCY - It is not practical to assign a frequency to a Standard Project Flood, but generally its recurrence interval would be more rare than once in 350 years. The occurrence of such a flood would be a very rare event; however, it could occur in any year.

POSSIBLE LARGER FLOODS - Floods larger than the Standard Project Flood are possible; however, the combination of factors that would be necessary to produce such floods would seldom occur. The consideration of floods of this magnitude should not be overlooked in the study of any problems.

HAZARDS OF GREAT FLOODS

AREAS FLOODED AND HEIGHTS OF FLOODING - The areas along Rocky River inundated by the Standard Project and Intermediate Regional Floods are shown on plates 5 and 6. Depths of flow for the Standard Project Flood, the Intermediate Regional Flood, and the January 1959 flood can be estimated from the sections which are shown on plates 10 through 12.

The January 1959, the Intermediate Regional and the Standard Project flood profiles were computed by using stream characteristics for selected reaches as determined from observed flood profiles, topographic maps and valley cross sections. The overflow areas shown on plates 5 and 6 and the water surface profiles shown on plates 7 through 9 have been determined with an accuracy consistent with the purpose of this study and the accuracy of the available basic data. The water surface profiles depend to a great extent upon the degree of destruction or clogging of various bridges during the flood occurrence. Because it is impossible to forecast these events, it was assumed that all bridge structures would stand and that no clogging would occur.

The Standard Project Flood profile for Rocky River is approximately 8 feet higher in the study area than the January 1959 flood stage.

The Intermediate Regional Flood profile averages approximately 0.5 foot higher than the 1959 flood stage.

The approximate heights that would be reached within the flood plain covered by this report by the Standard Project Flood, the Intermediate Regional Flood and the 1959 flood are shown in figures 26 through 31.

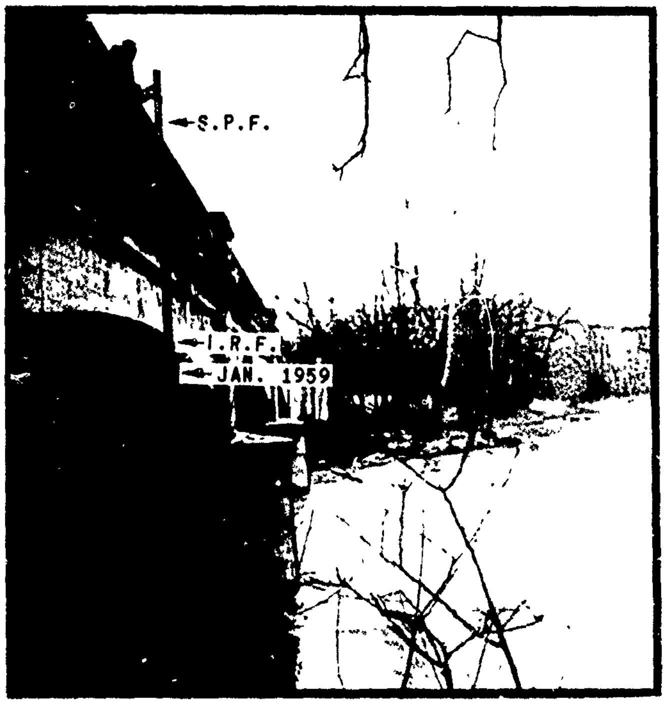


Figure 26 - Arrows indicate the heights of the Standard Project, Intermediate Regional and January 1959 Floods at upstream side of the Cedar Point Road bridge, stream mile 12.4.

Figure 27 - Arrows indicate the heights of the Standard Project, Intermediate Regional and January 1959 floods at intersection of Lewis Road and Rainbow Drive, stream mile 12.8.

Possible future flood heights
Photos taken March 1970

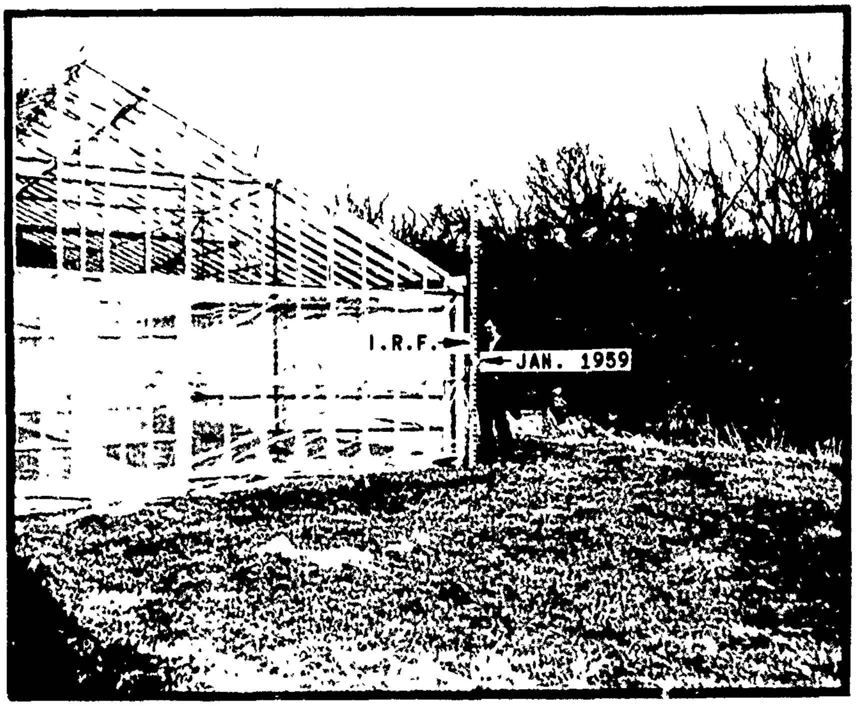


Figure 28 - Arrows indicate the heights of the Intermediate Regional and January 1959 floods at greenhouse downstream of Sprague Road bridge, stream mile 17.8.

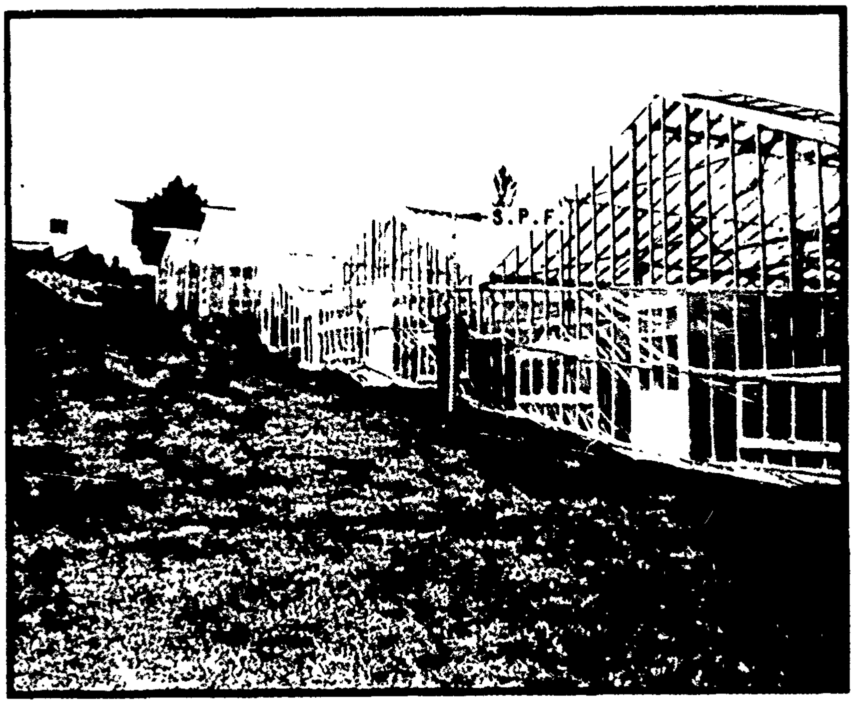


Figure 29 - Arrow indicates the height of the Standard Project flood at greenhouse downstream of Sprague Road bridge, stream mile 17.8.

Possible future flood heights
Photos taken March 1970

Figure 30 - Arrows indicate the heights of the Standard Project, Intermediate Regional and January 1959 floods at upstream side of Sprague Road bridge, stream mile 17.9.

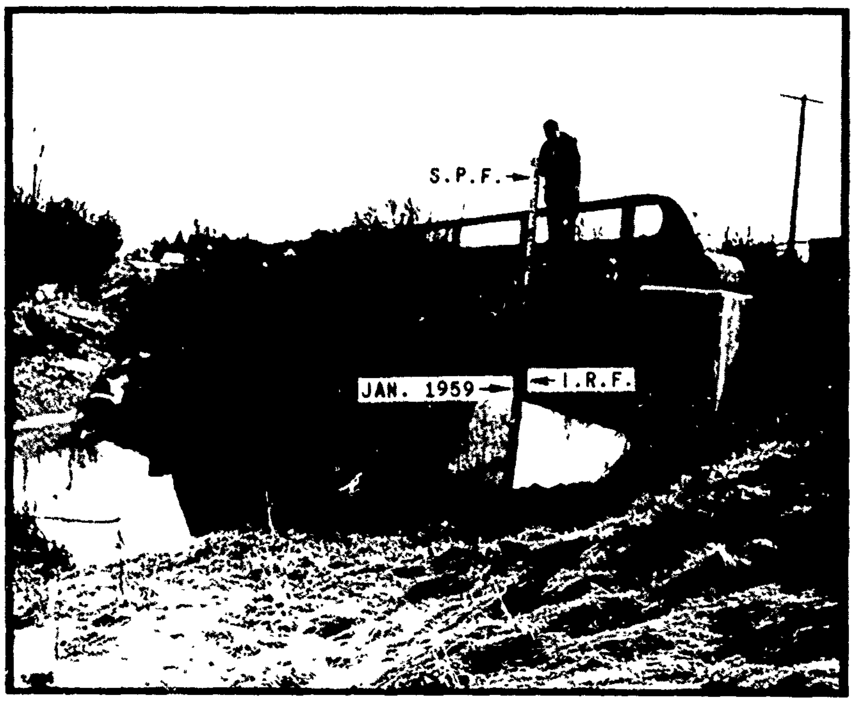


Figure 31 - Arrows indicate the heights of the Standard Project, Intermediate Regional and January 1959 floods at downstream side of Royalton Road bridge, stream mile 21.9.

Possible future flood heights
Photos taken March 1970

Elevations of the Intermediate Regional and Standard Project Floods should be given careful consideration in all future planning especially in the study area because of the difference between past and possible future flood heights.

VELOCITIES, RATES OF RISE AND DURATION OF FLOODING - Table 7 lists the average velocities that would occur in the channel and overbank areas during the Intermediate Regional and Standard Project Floods.

Rates of rise are dependent upon the shape of the basin, intensity of the storm, development within the basin and loss rate of rainfall. It can also depend upon the condition and amount of debris in the channel at the time of the storm. The duration of a flood above bankfull stage is dependent upon the duration of the storm and on the assumption that the storm was caused by rainfall and does not include prolonged runoff from snowmelt and high stages caused by ice jams, etc.

Table 8 lists the total time of rise, the maximum rate of rise, and the duration above flood stage for both the Intermediate Regional and the Standard Project Floods.

TABLE 7

AVERAGE MAXIMUM VELOCITIES

Location	Stream Mile	Flood	*Maximum Velocities channel (ft per sec)	*Maximum Velocities overbank (ft per sec)
U.S.G.S. gage	12.4	Intermediate Regional	6.6	2.4
		Standard Project	7.3	2.9
Valley Section A	12.9	Intermediate Regional	7.9	3.4
		Standard Project	9.4	4.5
Valley Section B	14.8	Intermediate Regional	8.3	3.3
		Standard Project	12.9	6.7
Valley Section F	23.3	Intermediate Regional	6.6	1.9
		Standard Project	6.3	2.6

* Average maximum velocity for selected location. Velocities could be greater in isolated areas, especially in overbank section. High channel and overbank velocities in combination with deep, fairly long-duration flooding would create a hazardous situation to the flood plain. When velocity (in feet per second) times depth (in feet) is greater than nine, hazardous conditions prevail.

TABLE 8

RATES OF RISE AND DURATIONS OF FLOODING
AT U.S.G.S. GAGE NEAR BEREA
RIVER MILE 12.4

Flood	Time of rise (hrs)	Maximum rate of rise (ft/hr)	Duration above bankfull stage (hrs)
Intermediate Regional	20	0.70	42
Standard Project	27	0.90	57

These rates of rise should give adequate warning that a flood is coming; however, debris clogging and ice jamming could act as a dam and cause water to back up and form a pond. When sufficient head accumulates in the pond to break the jam, a surge of water would flow downstream causing an almost instantaneous rate of rise.

GLOSSARY OF TERMS

Discharge. The quantity of flow in a stream at any given time, usually measured in cubic feet per second (cfs).

Flood. An overflow of lands not normally covered by water and that are used or usable by man. Floods have two essential characteristics: The inundation of land is temporary; and the land is adjacent to and inundated by overflow from a river or stream or an ocean, lake, or other body of standing water.

Normally a "flood" is considered as any temporary rise in stream flow or stage, but not the ponding of surface water, that results in significant adverse effects in the vicinity. Adverse effects may include damages from overflow of land areas, temporary backwater effects in sewers and local drainage channels, creation of unsanitary conditions or other unfavorable situations by deposition of materials in stream channels during flood recessions, rise of ground water coincident with increased stream flow, and other problems.

Flood Crest. The maximum stage or elevation reached by the waters of a flood at a given location.

Flood Peak. The maximum instantaneous discharge of a flood at a given location. It usually occurs at or near the time of the flood crest.

Flood Plain. The relatively flat area or low lands adjoining the channel of a river, stream or watercourse or ocean, lake, or other body of standing water, which has been or may be covered by flood water.

Flood Profile. A graph showing the relationship of water surface elevation to location, the latter generally expressed as distance above mouth, for a stream of water flowing in an open channel. It is generally drawn to show surface elevation for the crest of a specific flood, but may be prepared for conditions at a given time or stage.

Flood Stage. The stage or elevation at which overflow of the natural banks of a stream or body of water begins in the reach or area in which the elevation is measured.

Head Loss. The effect of obstructions, such as narrow bridge openings or buildings that limit the area through which water must flow, raising the surface of the water upstream from the obstruction.

Hydrograph. A curve denoting the discharge or stage of flow over a period of time.

Intermediate Regional Flood. A flood having an average frequency of occurrence in the order of once in 100 years although the flood may occur in any year. It is based on statistical analyses of streamflow records available for the watershed and analyses of rainfall and runoff characteristics in the "general region of the watershed."

Left Bank. The bank on the left side of a river, stream, or watercourse, looking downstream.

Low Steel (or Underclearance). See "underclearance."

Right Bank. The bank on the right side of a river, stream, or watercourse, looking downstream.

Standard Project Flood. The flood that may be expected from the most severe combination of meteorological and hydrological conditions that is considered reasonably characteristic of the geographical area in which the drainage basin is located, excluding extremely rare combinations. Peak discharges for these floods are generally about 40% to 60% of the Probable Maximum Floods for the same basins. Such floods, as used by the Corps of Engineers are intended as practicable expressions of the degree of protection that should be sought in the design of flood control works, the failure of which might be disastrous.

Underclearance. The lowest point of a bridge or other structure over or across a river, stream, or watercourse that limits the opening through which water flows. This is referred to as "low steel" in some regions.

AUTHORITY, ACKNOWLEDGMENTS AND INTERPRETATION OF DATA

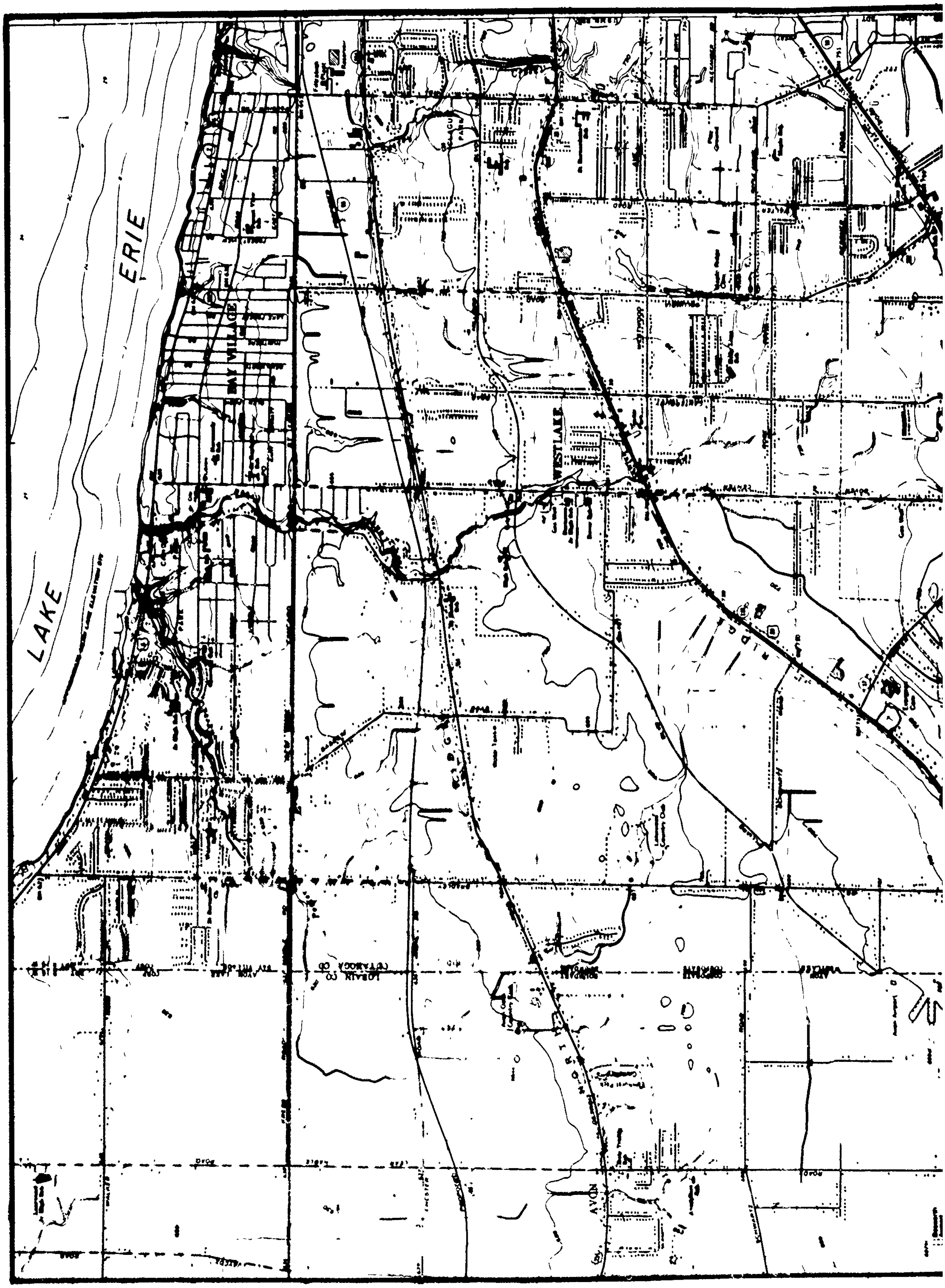
This report has been prepared by the Buffalo District of the U. S. Army Corps of Engineers in accordance with the authority granted by Section 206 of the Flood Control Act of 1960 (PL 86-465) as amended.

* * *

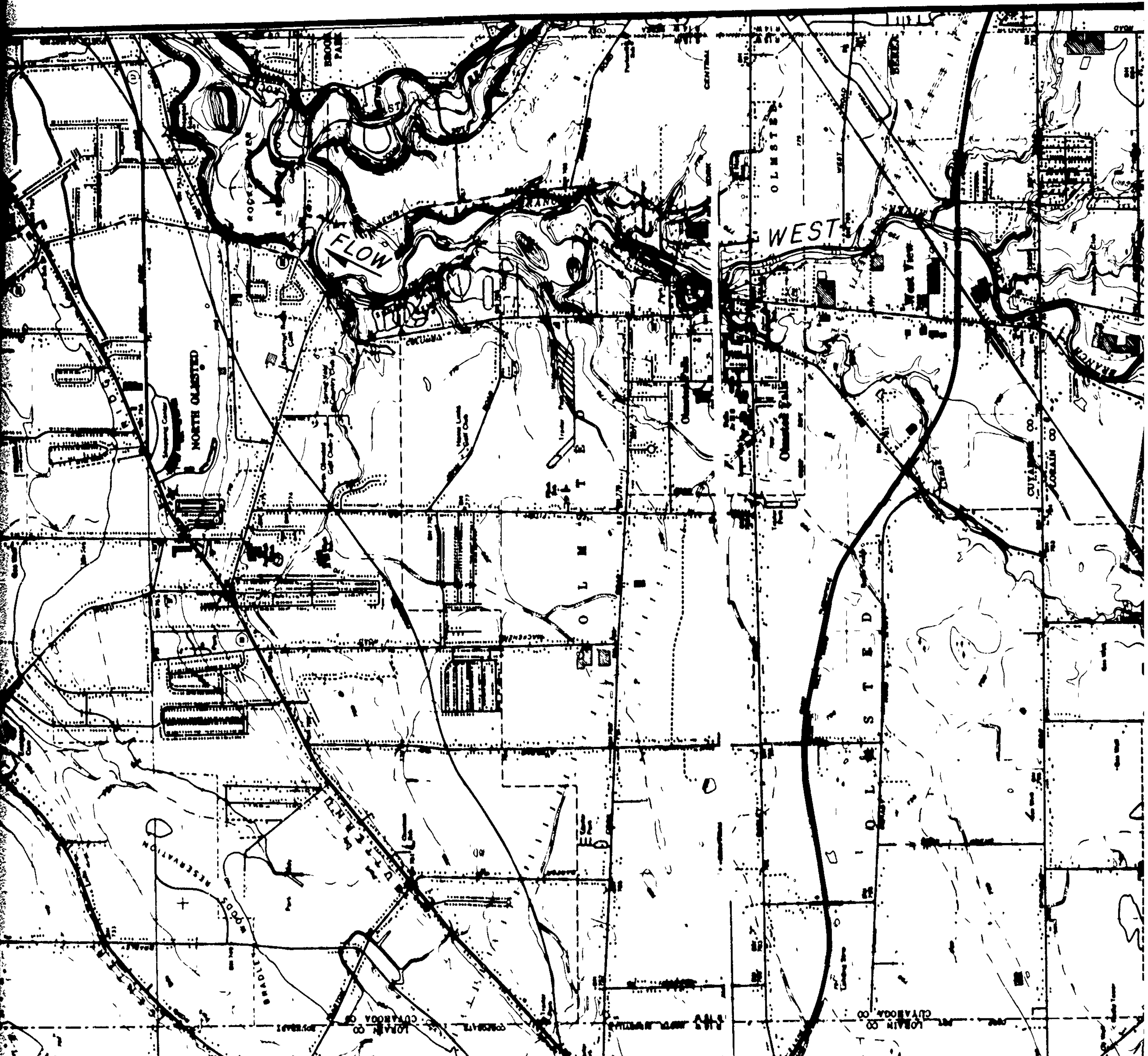
Assistance and cooperation of Federal, State and Local Agencies in supplying useful information is appreciated.

* * *

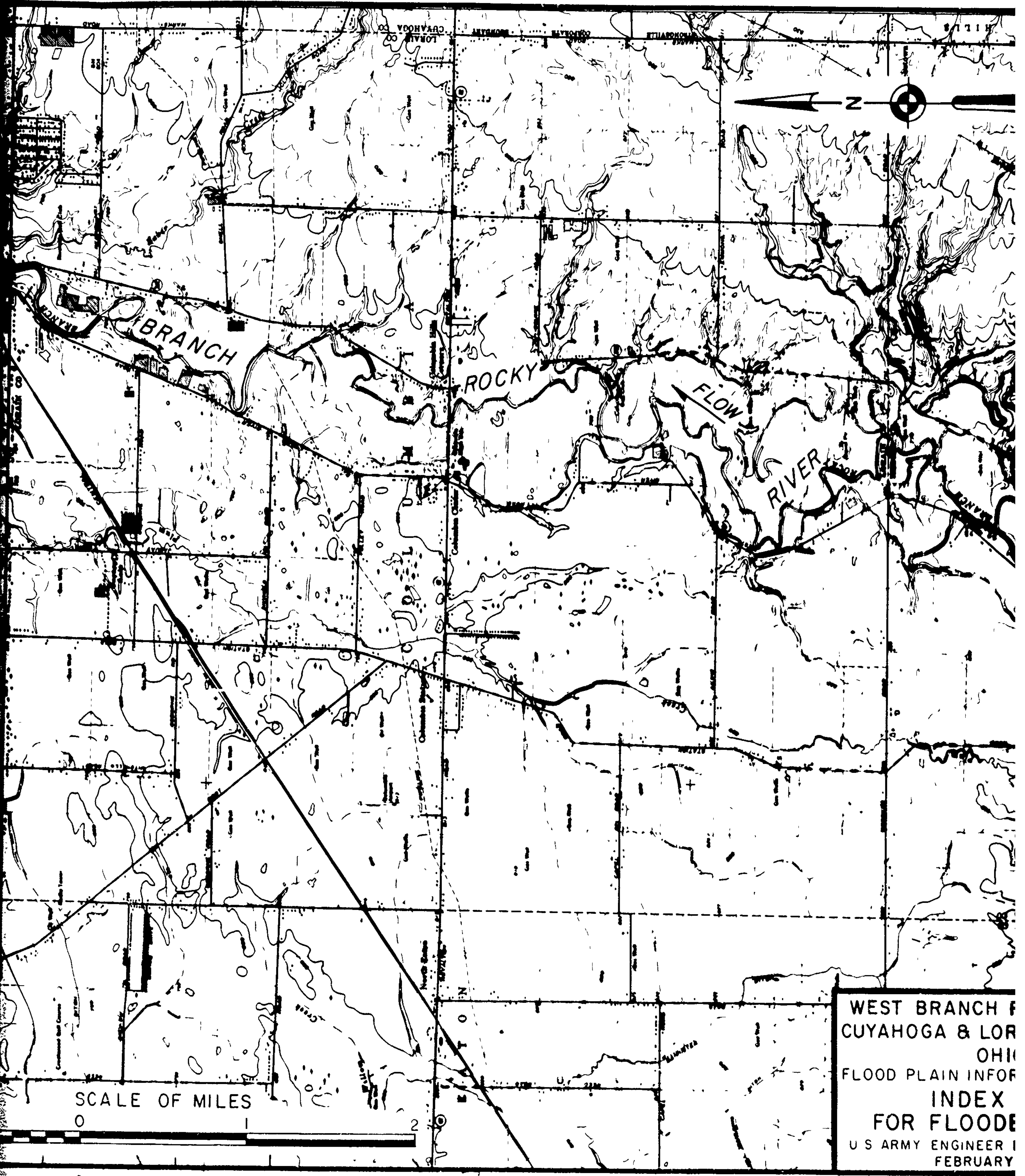
This report presents data on the local flood situation on the West Branch of the Rocky River, Ohio from the U.S.G.S. gaging station, mile 12.40, to the Lorain-Medina County Line, mile 26.4. The Buffalo District will provide, upon request, interpretation and limited technical assistance in the application of these data, particularly as to their use in developing effective flood plain regulations. Requests should be coordinated through the Ohio Department of Natural Resources, Division of Water. After local authorities have selected the flood magnitude or frequency to be used as the basis for regulation, further information on the effects of various widths of floodway on the profile of the selected flood can be provided to assist in final selection of floodway limits.



LAKE
ERIE
BAY VILLAGE
WESTLAKE
AVON

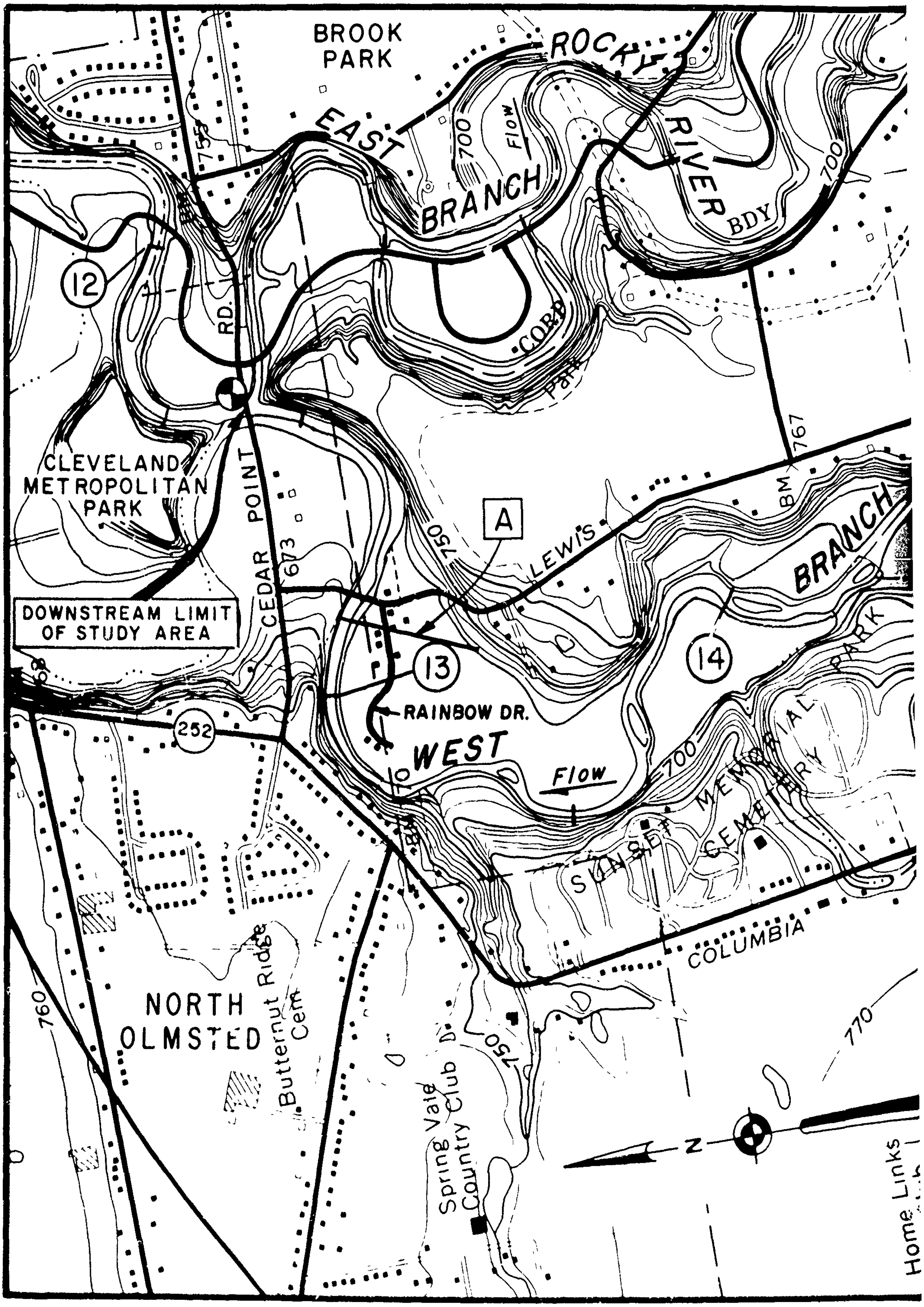


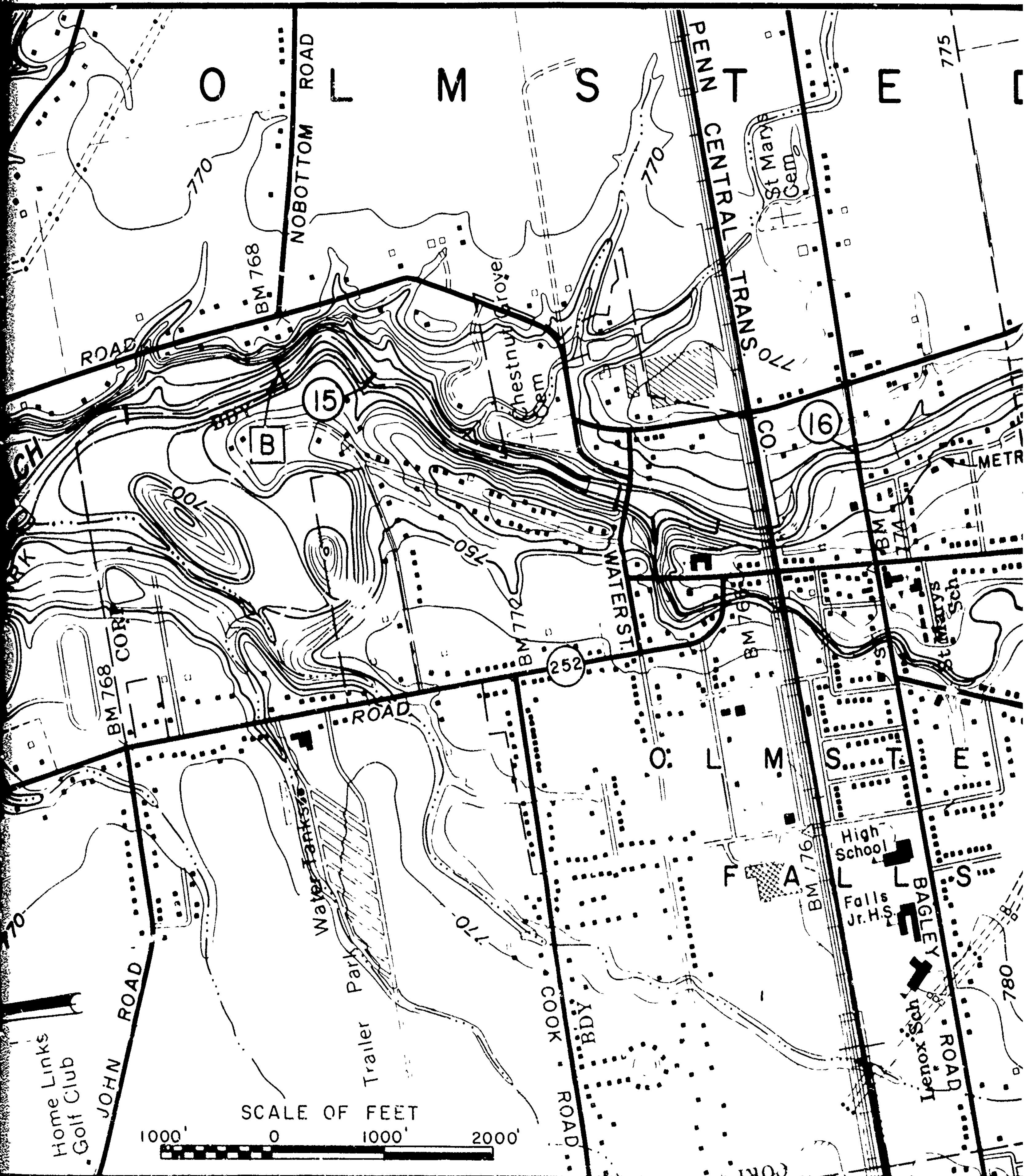
FLOW
WEST
BRANCH
NORTH OLMSTED
OLMSTED
NORTH RIDGEVILLE
CUYAHOGA CO
LORAIN CO
RESERVATION


BRANCH
ROCKY
FLOW
RIVER
N
SCALE OF MILES
0
1
2
WEST BRANCH R
CUYAHOGA & LOR
OHI
FLOOD PLAIN INFOR
INDEX
FOR FLOODE
U S ARMY ENGINEER
FEBRUARY

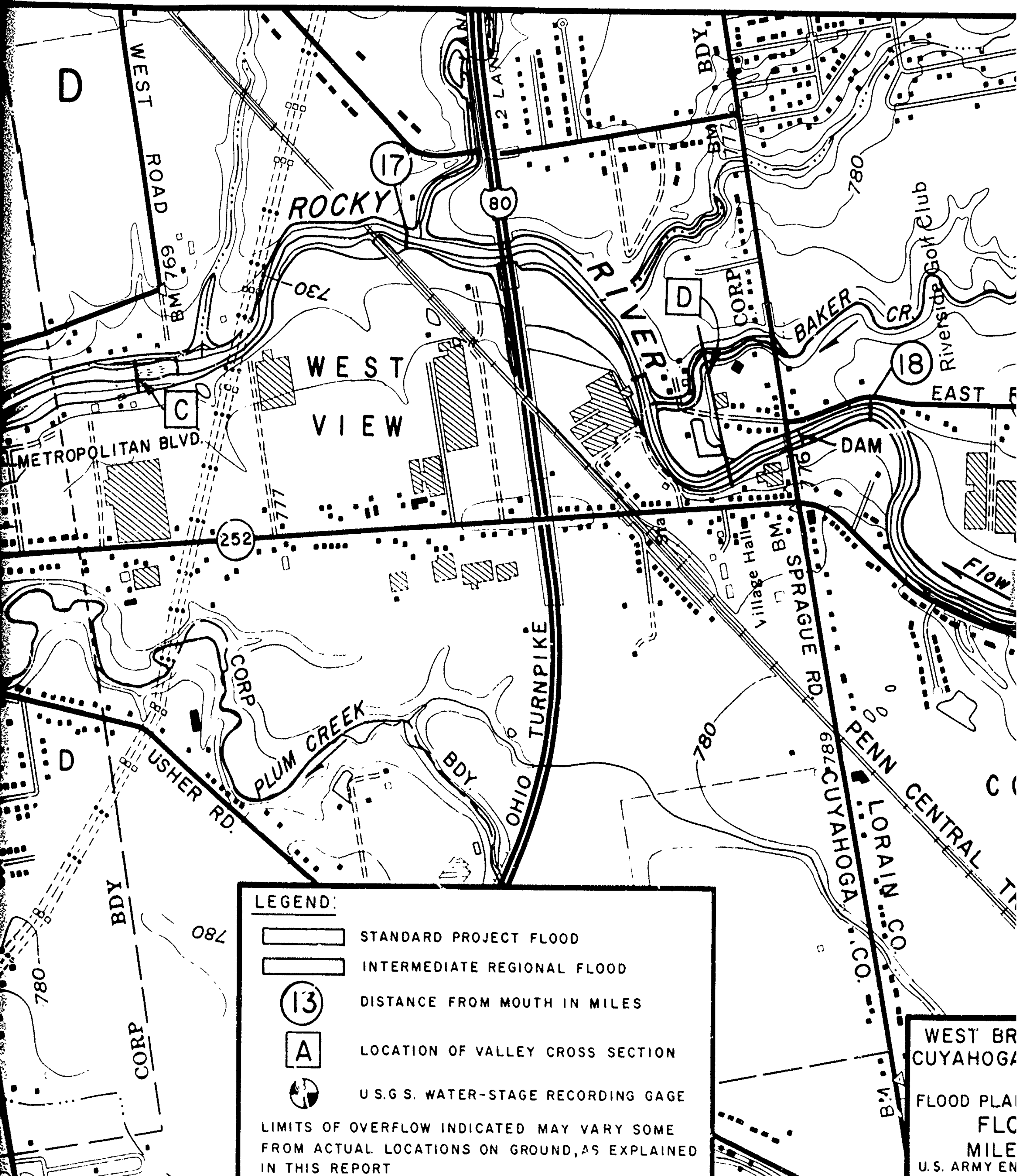
NCH ROCKY RIVER
LORAIN COUNTIES
OHIO
INFORMATION REPORT
EX MAP
ODED AREAS
EER DISTRICT, BUFFALO
UARY 1971

PLATE 4

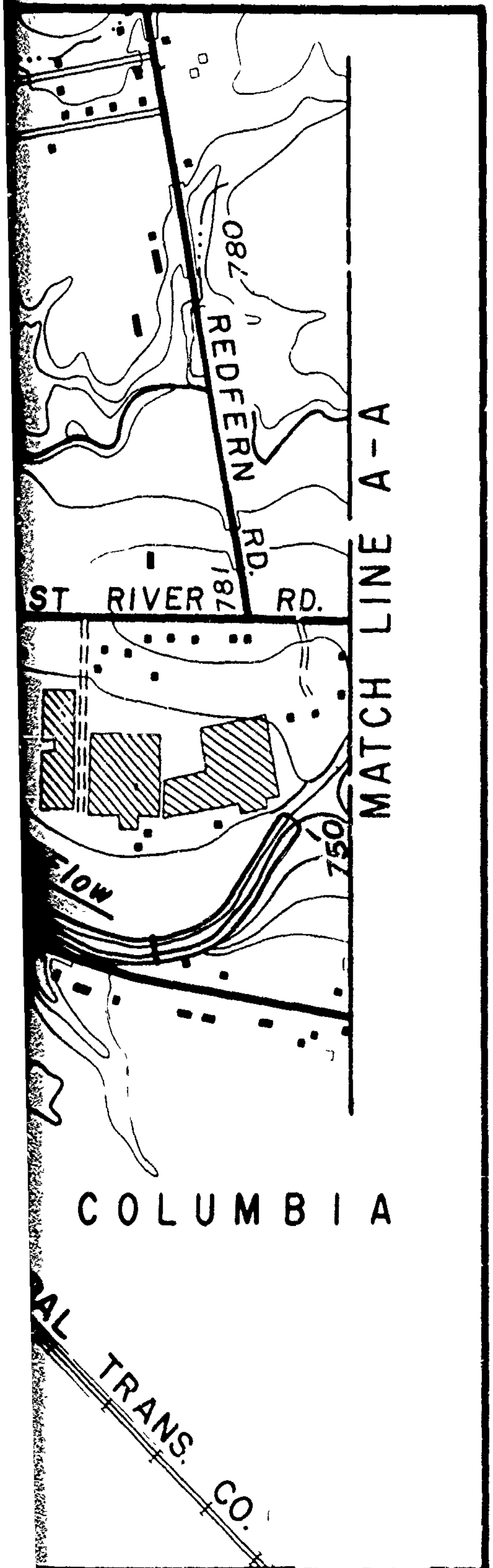

BROOK PARK
EAST BRANCH ROCKY RIVER
Flow
700
755
RD.
BDY
12
CORP
Park
CLEVELAND METROPOLITAN PARK
CEDAR POINT
673
750
A
LEWIS
BM
767
BRANCH
DOWNSTREAM LIMIT OF STUDY AREA
13
14
RAINBOW DR.
WEST
Flow
252
SUNSET MEMORIAL PARK
CEMETERY
COLUMBIA
NORTH OLMSTED
Butternut Ridge Cem
760
Spring Vale Country Club
770
N
Home Links



O L M S T E D
NOBOTTOM ROAD
PENN CENTRAL TRANS. CO
St Marys Cem
775
770
BM 768
ROAD
Chestnut Grove Cem
15
16
B
BDY
700
750
WATER ST
BM 774
St Marys Sch
BM 772
252
ROAD
O L M S T E
F A L L S
High School
Falls Jr. H.S.
BAGLEY ROAD
BM 768
Water Tanks
Park
Trailer
COOK ROAD
BDY
Lenox Sch
JOHN ROAD
Home Links Golf Club
780
SCALE OF FEET
1000' 0 1000' 2000'

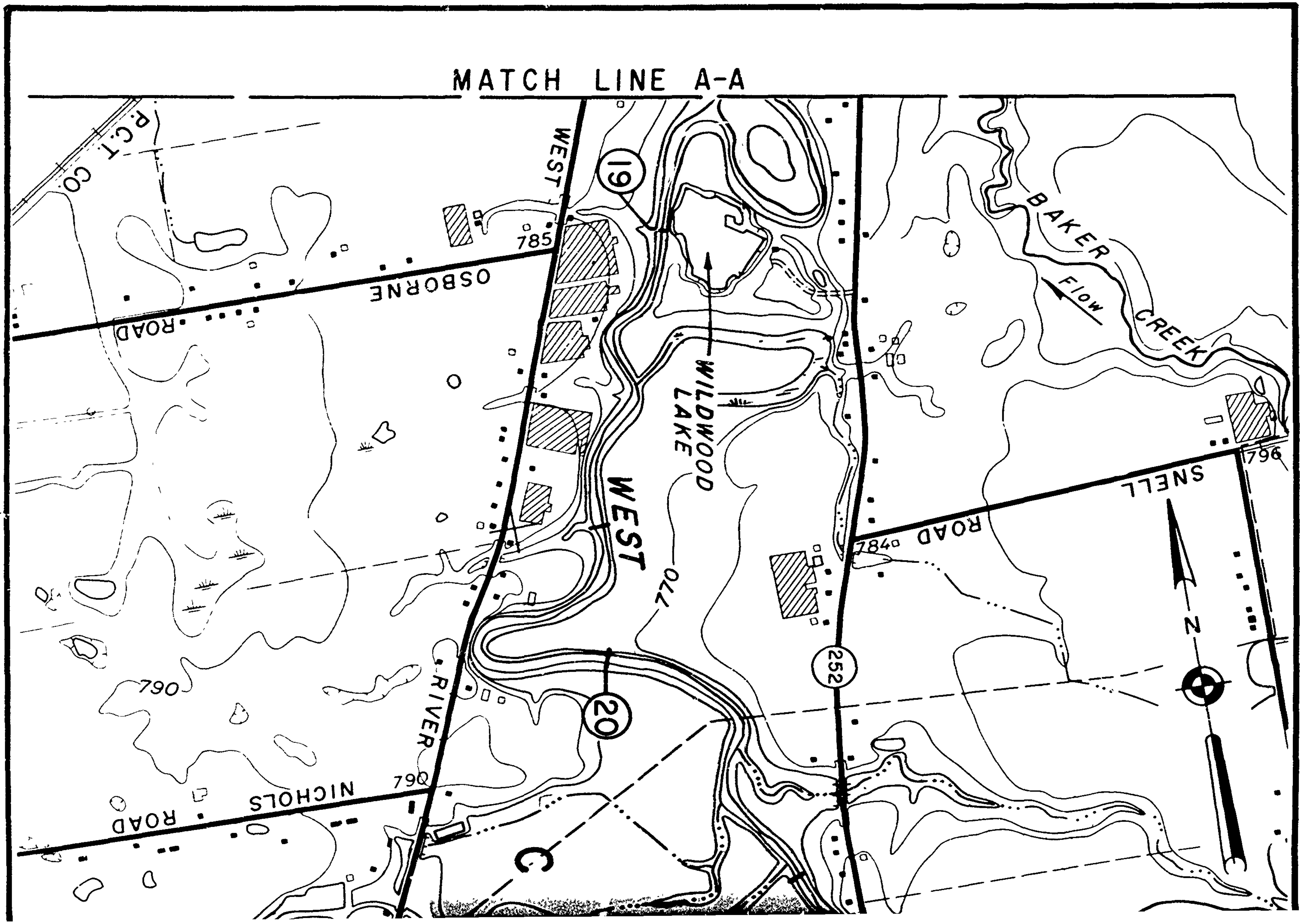


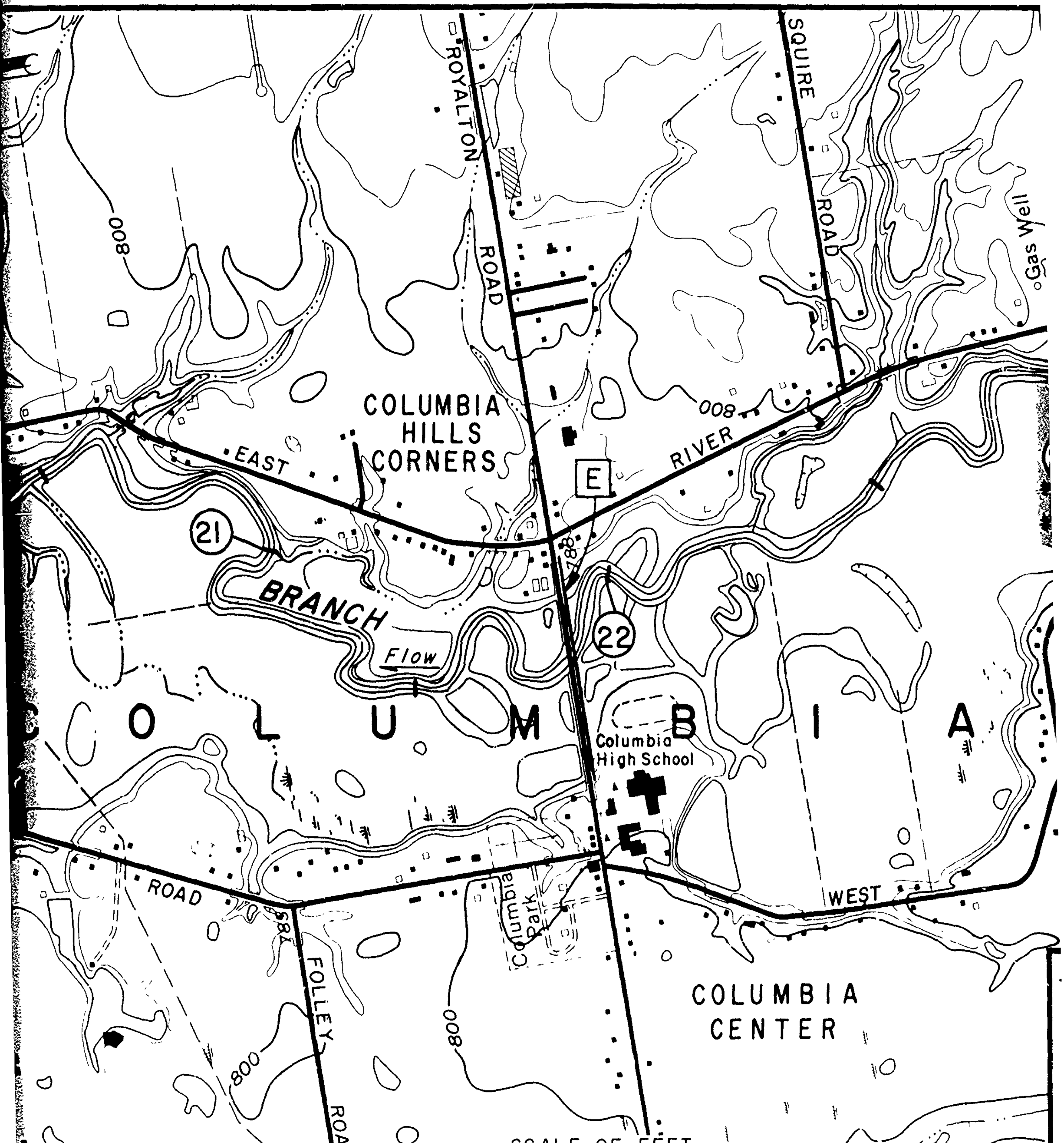
D
WEST ROAD
BM 769
ROCKY RIVER
17
80
2 LANE
BDY
BM 777
780
730
D
CORP
BAKER CR.
Riverside Golf Club
18
EAST
C
WEST VIEW
METROPOLITAN BLVD.
DAM
Flow
252
777
Village Hall
BM
SPRAGUE RD.
OHIO TURNPIKE
CORP
PLUM CREEK
BDY.
USHER RD.
D
780
789
CUYAHOGA CO.
LORAIN CO.
PENN CENTRAL
BDY
CORP
780
LEGEND:
STANDARD PROJECT FLOOD
INTERMEDIATE REGIONAL FLOOD
13
DISTANCE FROM MOUTH IN MILES
A
LOCATION OF VALLEY CROSS SECTION
U.S.G.S. WATER-STAGE RECORDING GAGE
LIMITS OF OVERFLOW INDICATED MAY VARY SOME FROM ACTUAL LOCATIONS ON GROUND, AS EXPLAINED IN THIS REPORT
WEST BR
CUYAHOGA
FLOOD PLA
FLO
MILE
U.S. ARMY EN



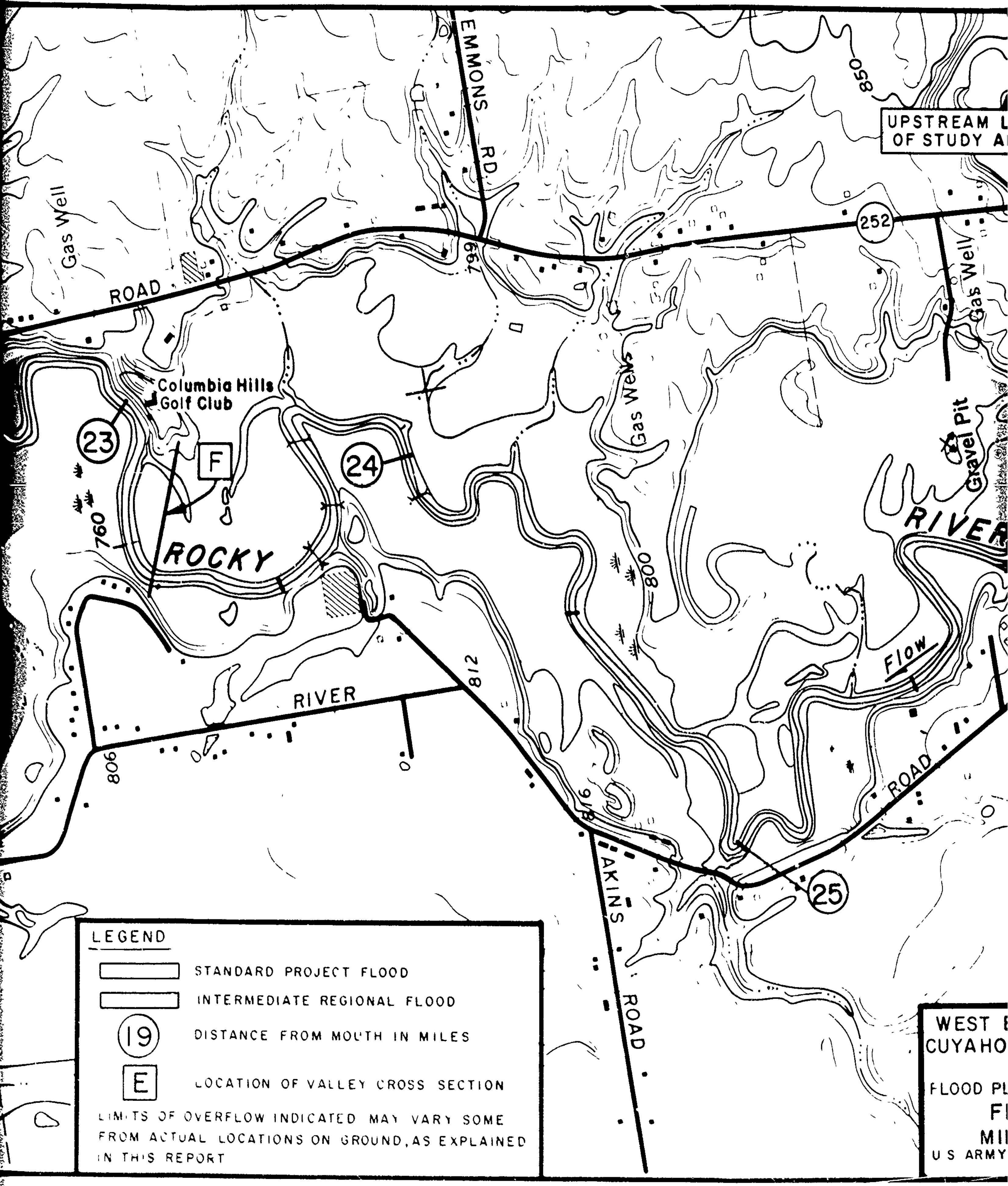
ST BRANCH ROCKY RIVER
HOGA & LORAIN COUNTIES
OHIO
D PLAIN INFORMATION REPORT
FLOODED AREAS
MILE 12.4 TO 18.75
RMY ENGINEER DISTRICT, BUFFALO
FEBRUARY 1971

PLATE 5


MATCH LINE A-A
P.C.T. CO.
WEST
19
785
OSBORNE
ROAD
WILDWOOD
LAKE
BAKER
CREEK
Flow
796
SNELL
ROAD
784
WEST
770
252
RIVER
20
790
NICHOLS
ROAD
790
N
C

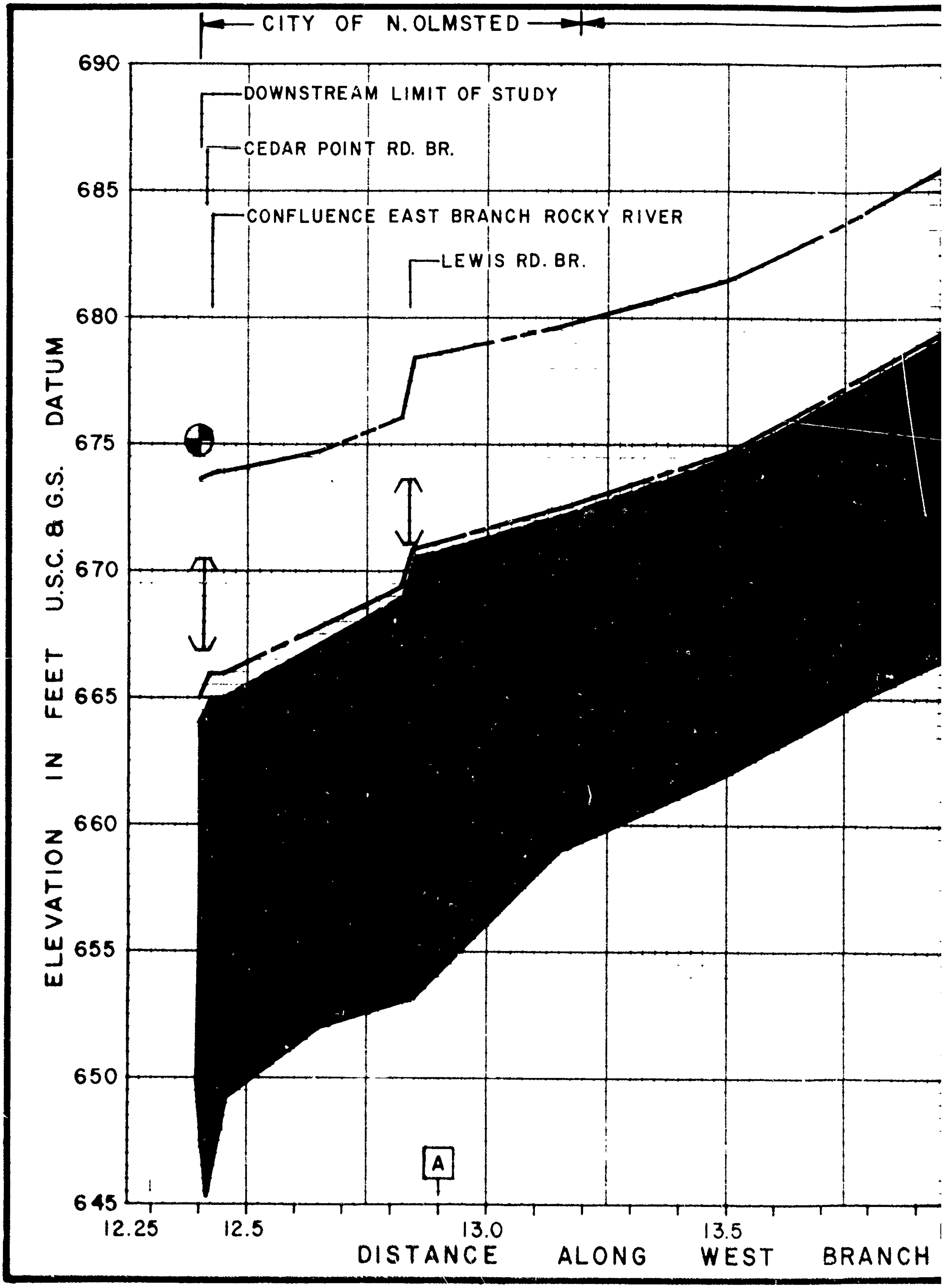


ROYALTON
ROAD
SQUIRE
ROAD
Gas Well
800
COLUMBIA
HILLS
CORNERS
EAST
RIVER
E
21
BRANCH
Flow
22
788
COLUMBIA
Columbia
High School
ROAD
FOLLEY
ROAD
Columbia
Park
WEST
COLUMBIA
CENTER
SCALE OF FEET
1000'
0
1000'
2000'

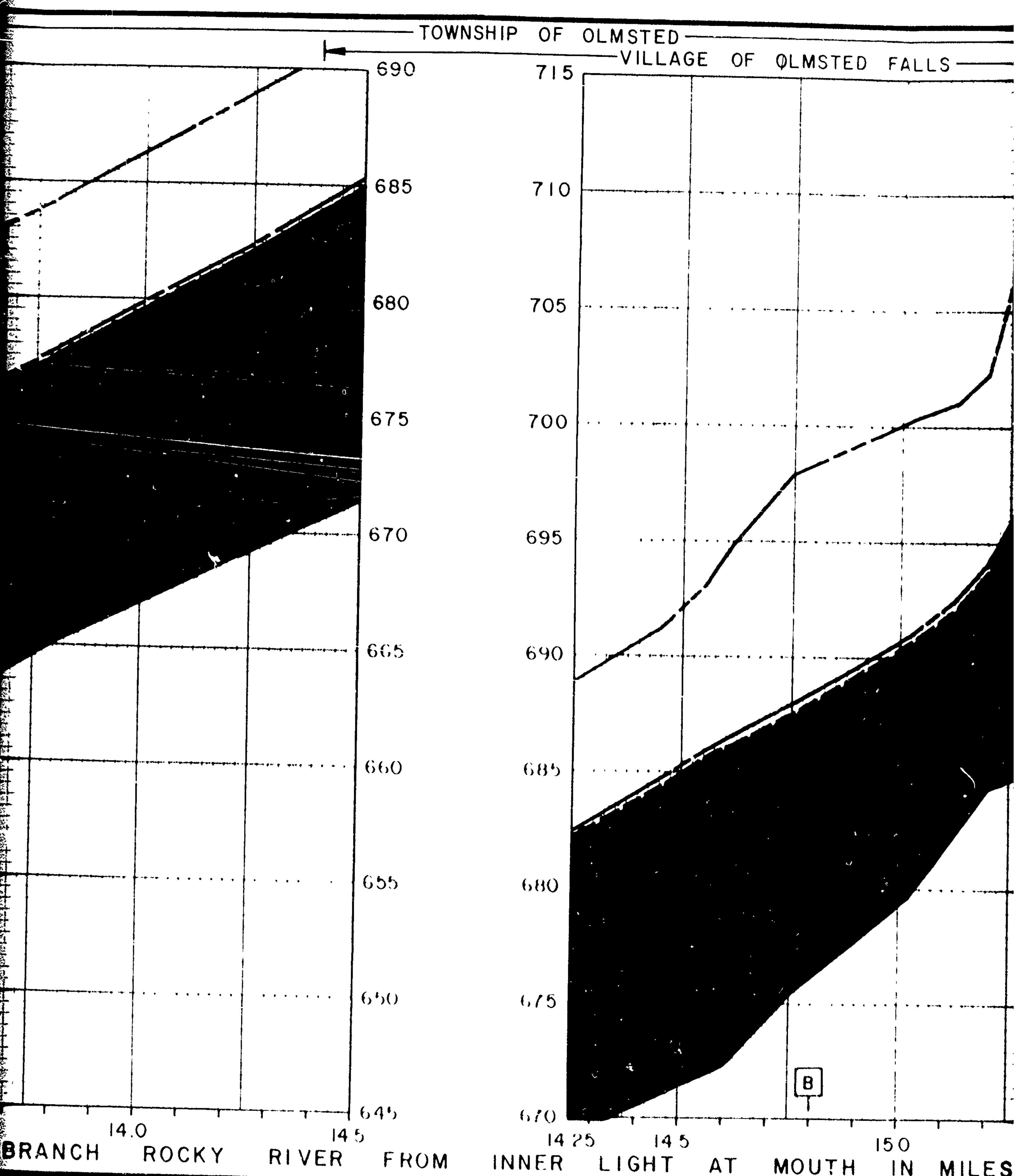

EMMONS RD.
850
UPSTREAM L
OF STUDY A
Gas Well
ROAD
799
252
Gas Well
Columbia Hills
Golf Club
23
F
24
Gas Wells
Gravel Pit
RIVER
760
ROCKY
800
812
Flow
RIVER
806
ROAD
816
AKINS
25
ROAD
LEGEND
STANDARD PROJECT FLOOD
INTERMEDIATE REGIONAL FLOOD
19
DISTANCE FROM MOUTH IN MILES
E
LOCATION OF VALLEY CROSS SECTION
LIMITS OF OVERFLOW INDICATED MAY VARY SOME FROM ACTUAL LOCATIONS ON GROUND, AS EXPLAINED IN THIS REPORT
WEST
CUYAHO
FLOOD PL
U S ARMY

EST BRANCH ROCKY RIVER
YAHOGA & LORAIN COUNTIES
OHIO
OD PLAIN INFORMATION REPORT
FLOODED AREAS
MILE 18.75 TO 26.4
ARMY ENGINEER DISTRICT BUFFALO
FEBRUARY 1971

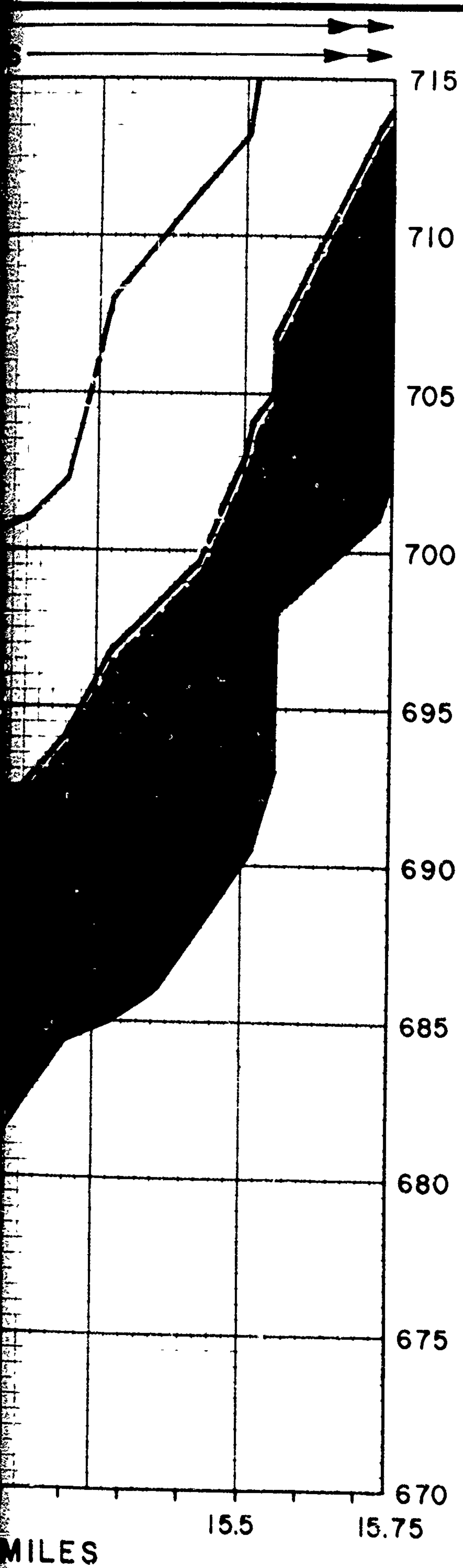
PLATE 6



CITY OF N. OLMSTED
DOWNSTREAM LIMIT OF STUDY
CEDAR POINT RD. BR.
CONFLUENCE EAST BRANCH ROCKY RIVER
LEWIS RD. BR.
ELEVATION IN FEET U.S.C. & G.S. DATUM
690
685
680
675
670
665
660
655
650
645
A
12.25
12.5
13.0
13.5
DISTANCE ALONG WEST BRANCH



TOWNSHIP OF OLMSTED
VILLAGE OF OLMSTED FALLS
690
685
680
675
670
665
660
655
650
645
715
710
705
700
695
690
685
680
675
670
B
14.0
14.5
14.25
14.5
15.0
BRANCH ROCKY RIVER FROM INNER LIGHT AT MOUTH IN MILES



LEGEND:

STANDARD PROJECT FLOOD

INTERMEDIATE REGIONAL FLOOD

JANUARY 1959 FLOOD

APPROXIMATE RIVER BED

APPROXIMATE FLOOR ELEVATION

APPROXIMATE LOW STEEL ELEVATION

U.S.G.S. WATER-STAGE RECORDING GAGE

A LOCATION OF VALLEY CROSS SECTION

NOTES:

CREST PROFILES ARE BASED ON THE FOLLOWING:
1. EXISTING CHANNEL CONDITIONS
2. EXISTING STRUCTURES
3. EXISTING CONDITIONS OF DEVELOPMENT

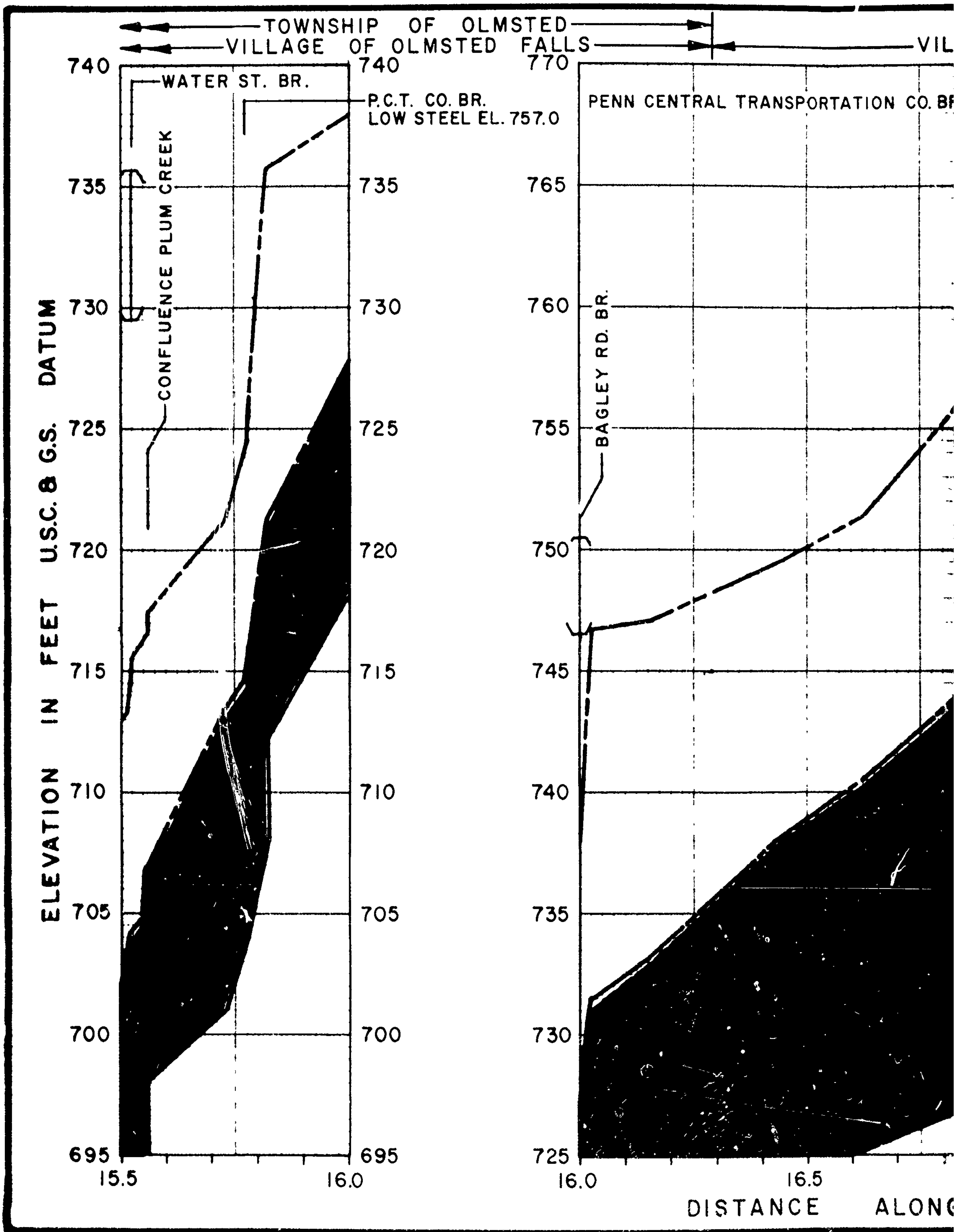
LARGE SCALE FILLING WILL RAISE PROFILES UNLESS SUFFICIENT FLOODWAY IS PROVIDED.

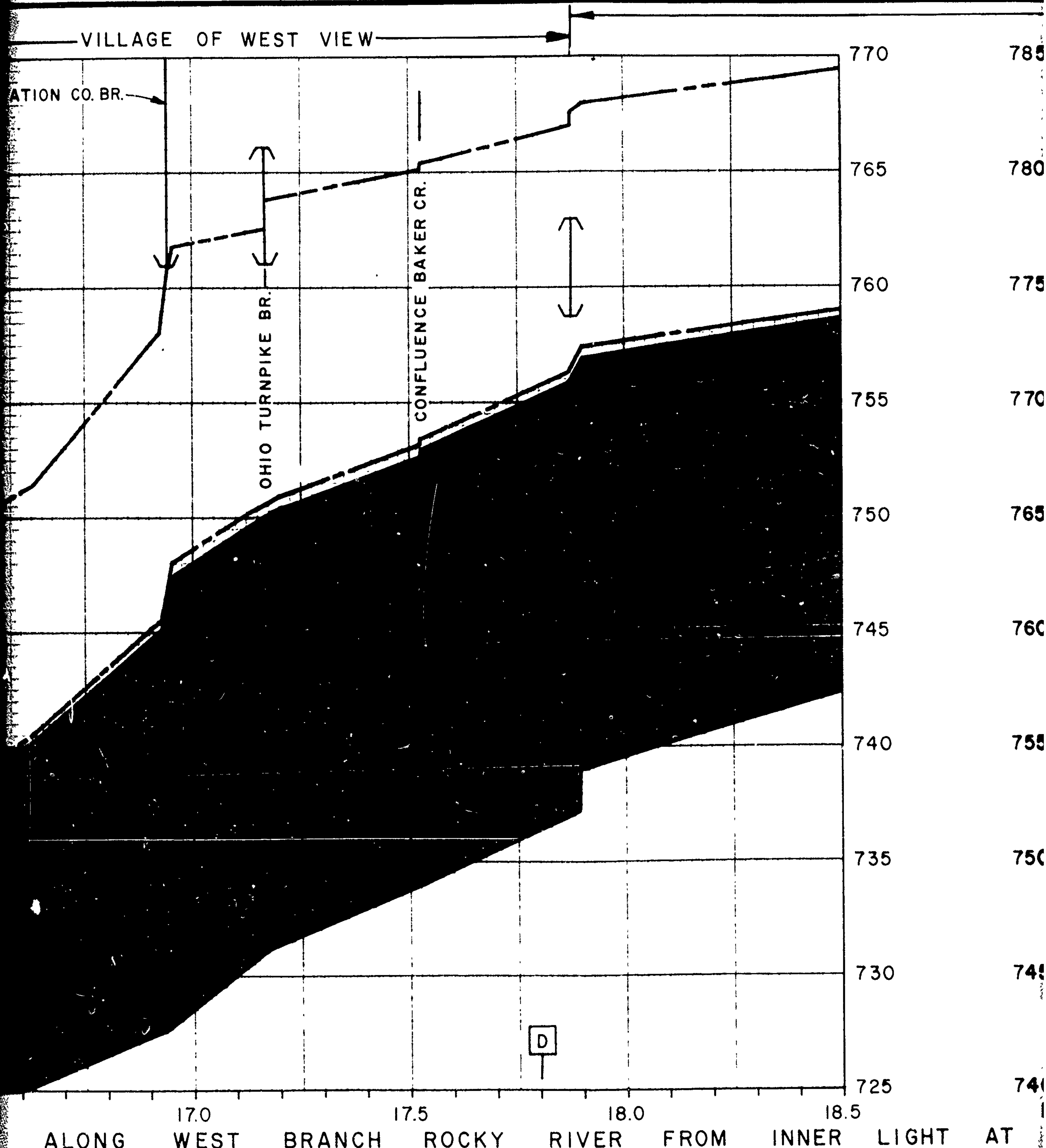
WEST BRANCH ROCKY RIVER
CUYAHOGA & LORAIN COUNTIES
OHIO
FLOOD PLAIN INFORMATION REPORT

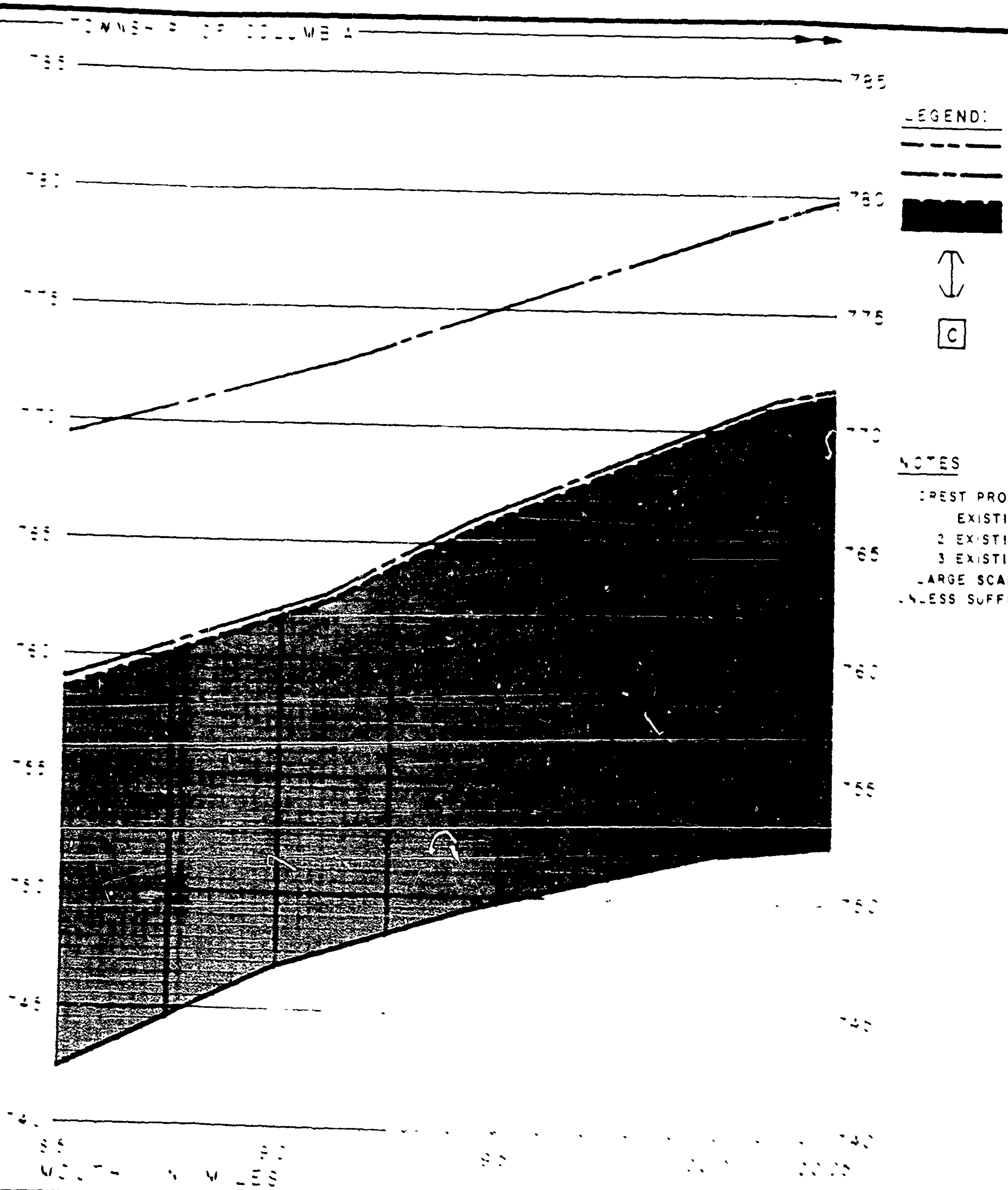
PROFILES

MILE 12.4 TO 15.75

U.S. ARMY ENGINEER DISTRICT, BUFFALO
FEBRUARY 1971


TOWNSHIP OF OLMSTED
VILLAGE OF OLMSTED FALLS
VIL
WATER ST. BR.
P.C.T. CO. BR.
LOW STEEL EL. 757.0
CONFLUENCE PLUM CREEK
PENN CENTRAL TRANSPORTATION CO. BR
BAGLEY RD. BR.
ELEVATION IN FEET U.S.C. & G.S. DATUM
740
735
730
725
720
715
710
705
700
695
770
765
760
755
750
745
740
735
730
725
15.5
16.0
16.0
16.5
DISTANCE ALONG


VILLAGE OF WEST VIEW
ATION CO. BR.
OHIO TURNPIKE BR.
CONFLUENCE BAKER CR.
D
770
765
760
755
750
745
740
735
730
725
785
780
775
770
765
760
755
750
745
740
17.0
17.5
18.0
18.5
ALONG WEST BRANCH ROCKY RIVER FROM INNER LIGHT AT



NOTES

CREST PROFI

EXISTIN

2 EXISTIN

3 EXISTIN

LARGE SCALE

UNLESS SUFFIC

END:

STANDARD PROJECT FLOOD

INTERMEDIATE REGIONAL FLOOD

JANUARY 1959 FLOOD

APPROXIMATE RIVER BED

APPROXIMATE FLOOR ELEVATION

APPROXIMATE LOW STEEL ELEVATION

C LOCATION OF VALLEY CROSS SECTION

ES:

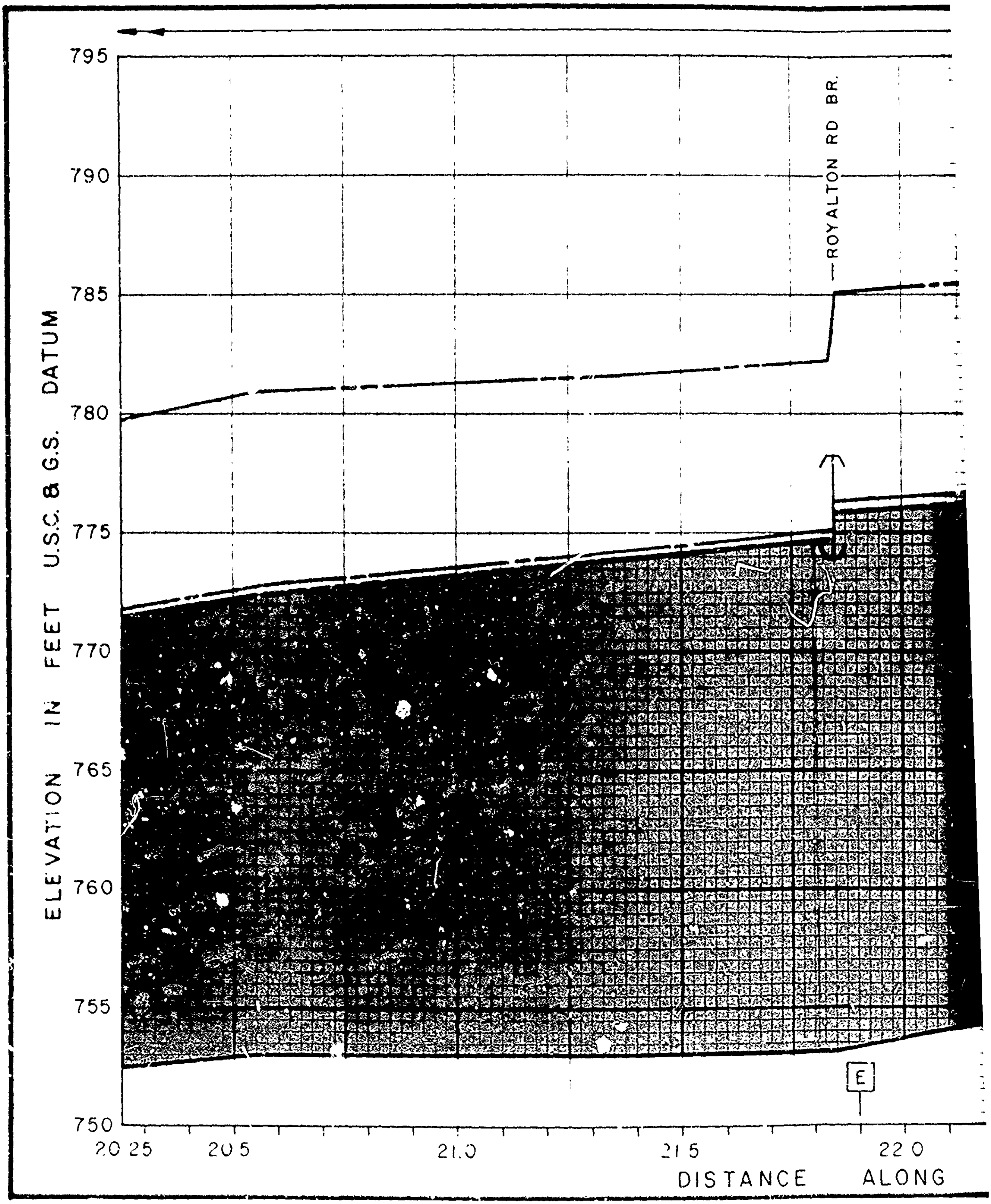
EST PROFILES ARE BASED ON THE FOLLOWING:

1. EXISTING CHANNEL CONDITIONS
2. EXISTING STRUCTURES
3. EXISTING CONDITIONS OF DEVELOPMENT

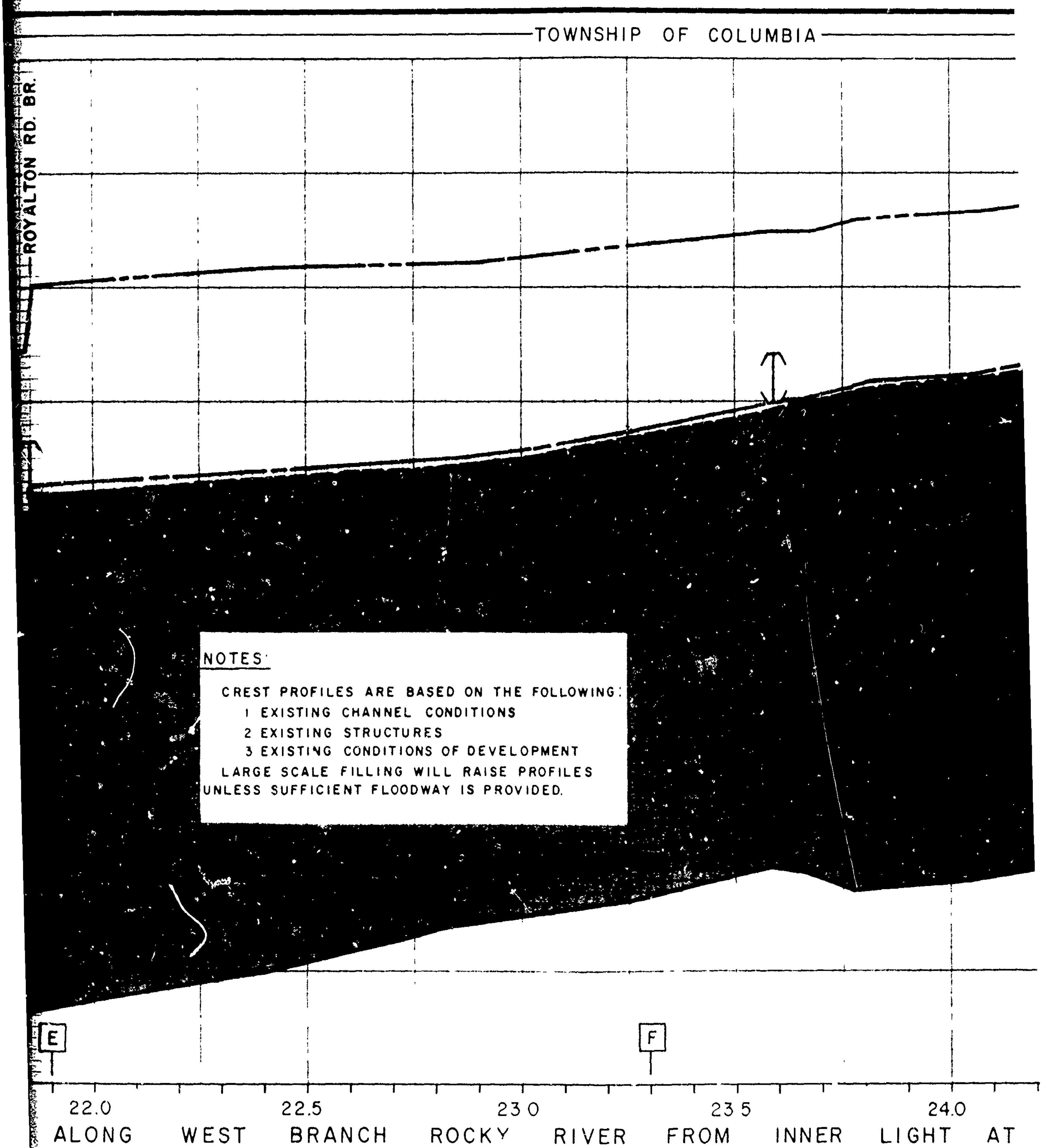
RGE SCALE FILLING WILL RAISE PROFILES
SS SUFFICIENT FLOODWAY IS PROVIDED.

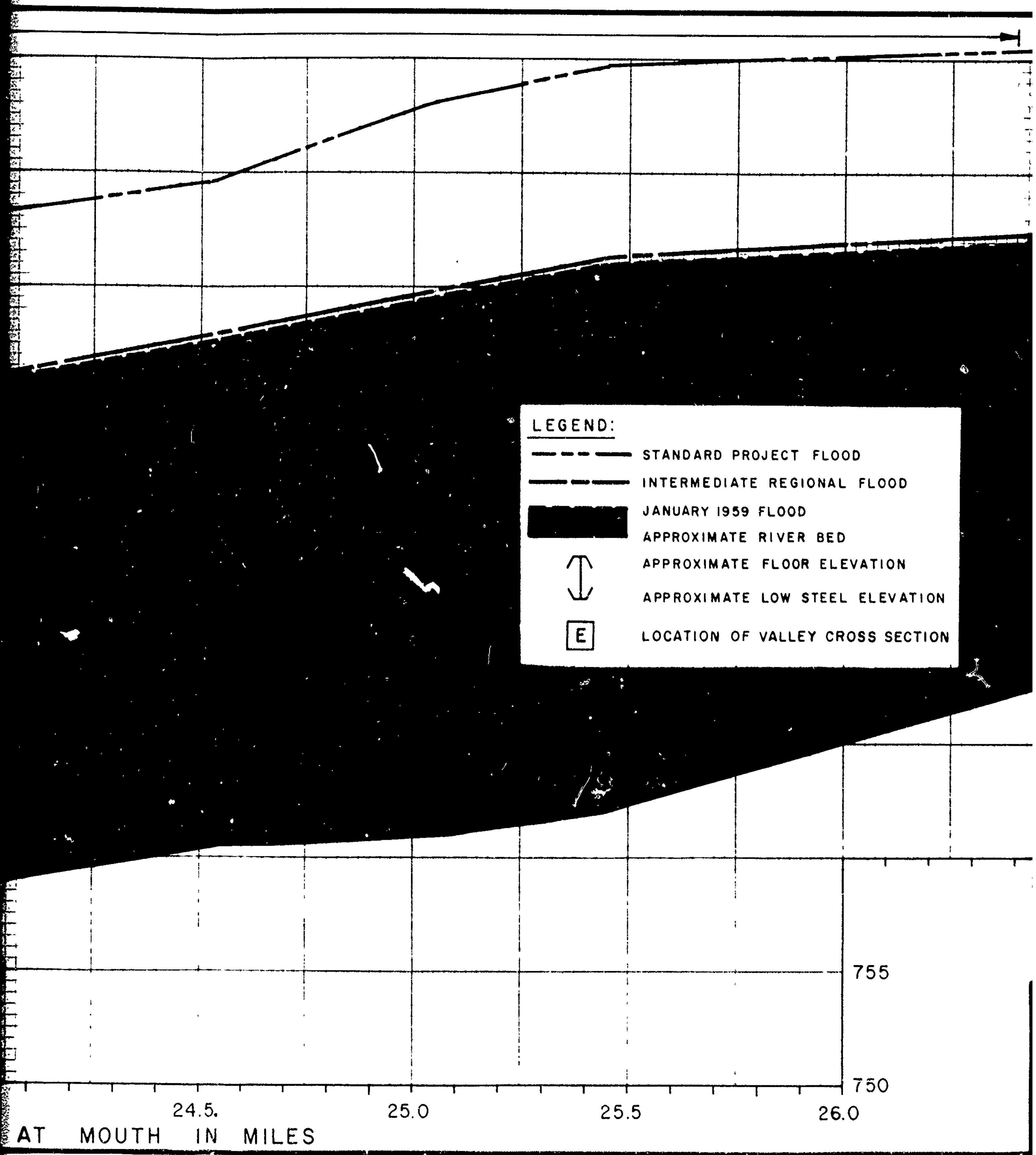
WEST BRANCH ROCKY RIVER
CUYAHOGA & LORAIN COUNTIES
OHIO
FLOOD PLAIN INFORMATION REPORT
PROFILES
MILE 15.5 TO 20.25
U.S. ARMY ENGINEER DISTRICT, BUFFALO
FEBRUARY 1971

PLATE 8

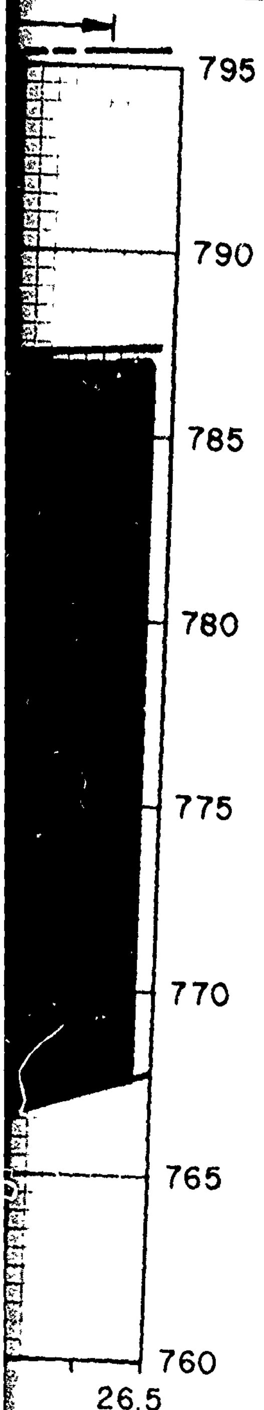


ROYALTON RD BR.
ELEVATION IN FEET U.S.C. & G.S. DATUM
795
790
785
780
775
770
765
760
755
750
20.25
20.5
21.0
21.5
22.0
E
DISTANCE ALONG

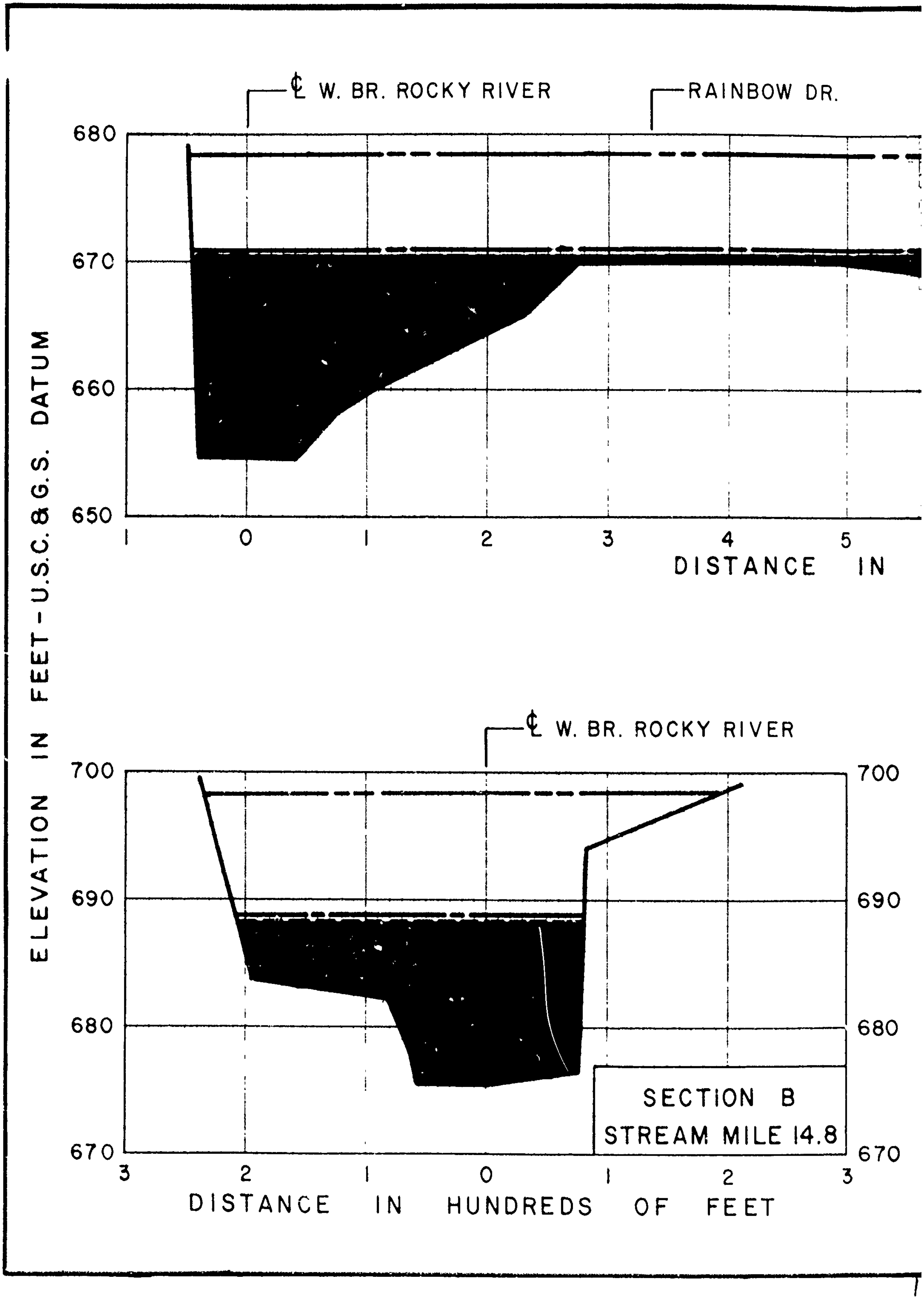

TOWNSHIP OF COLUMBIA
ROYALTON RD. BR.
NOTES:
CREST PROFILES ARE BASED ON THE FOLLOWING:
1 EXISTING CHANNEL CONDITIONS
2 EXISTING STRUCTURES
3 EXISTING CONDITIONS OF DEVELOPMENT
LARGE SCALE FILLING WILL RAISE PROFILES
UNLESS SUFFICIENT FLOODWAY IS PROVIDED.
E
F
22.0
22.5
23.0
23.5
24.0
ALONG WEST BRANCH ROCKY RIVER FROM INNER LIGHT AT



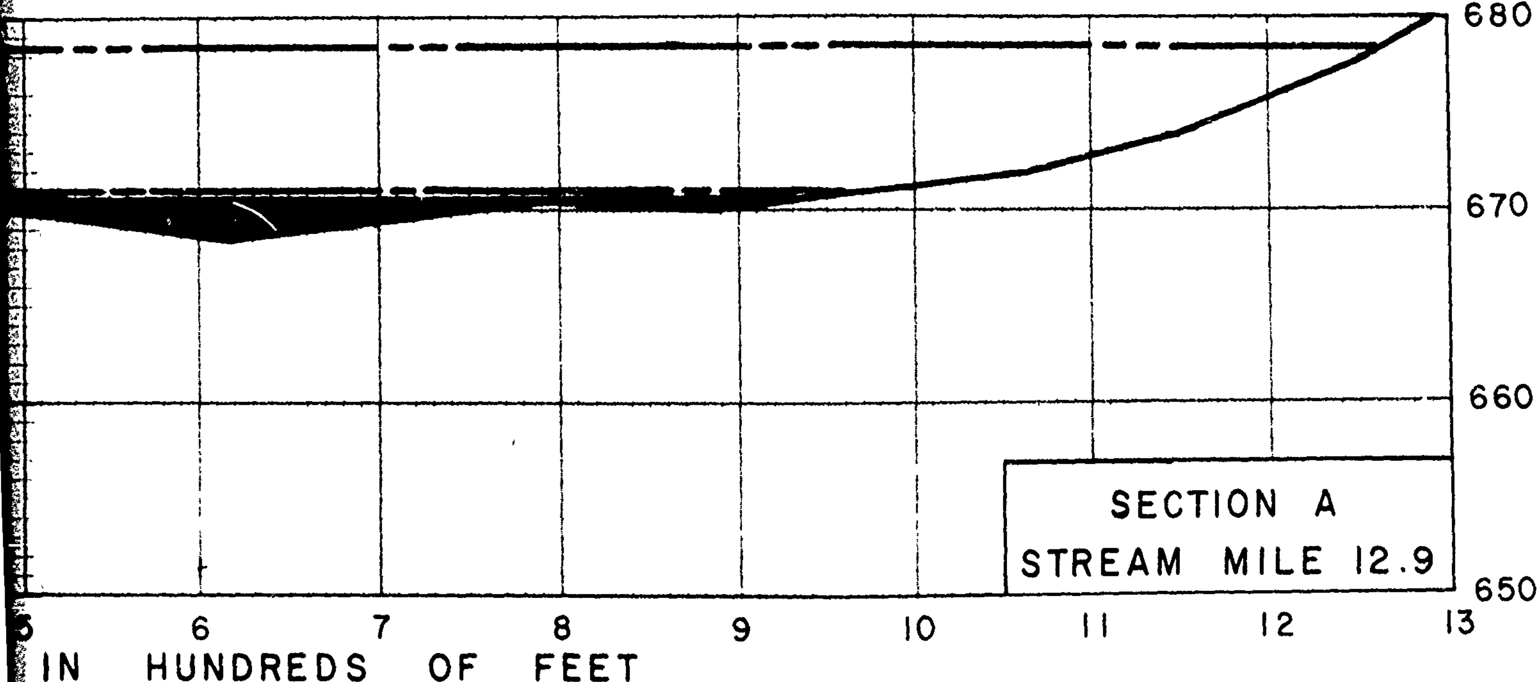
LEGEND:
STANDARD PROJECT FLOOD
INTERMEDIATE REGIONAL FLOOD
JANUARY 1959 FLOOD
APPROXIMATE RIVER BED
APPROXIMATE FLOOR ELEVATION
APPROXIMATE LOW STEEL ELEVATION
E
LOCATION OF VALLEY CROSS SECTION
755
750
24.5.
25.0
25.5
26.0
AT MOUTH IN MILES



WEST BRANCH ROCKY RIVER
CUYAHOGA & LORAIN COUNTIES
OHIO
FLOOD PLAIN INFORMATION REPORT
PROFILES
MILE 20.25 TO 26.4
U.S. ARMY ENGINEER DISTRICT, BUFFALO
FEBRUARY 1971



℄ W. BR. ROCKY RIVER
RAINBOW DR.
680
670
660
650
1
0
1
2
3
4
5
DISTANCE IN
ELEVATION IN FEET - U.S.C.&G.S. DATUM
℄ W. BR. ROCKY RIVER
700
690
680
670
3
2
1
0
1
2
3
DISTANCE IN HUNDREDS OF FEET
SECTION B
STREAM MILE 14.8



700

690

680

670

LEGEND:

STANDARD PROJECT FLOOD

INTERMEDIATE REGIONAL FLOOD

JANUARY 1959 FLOOD

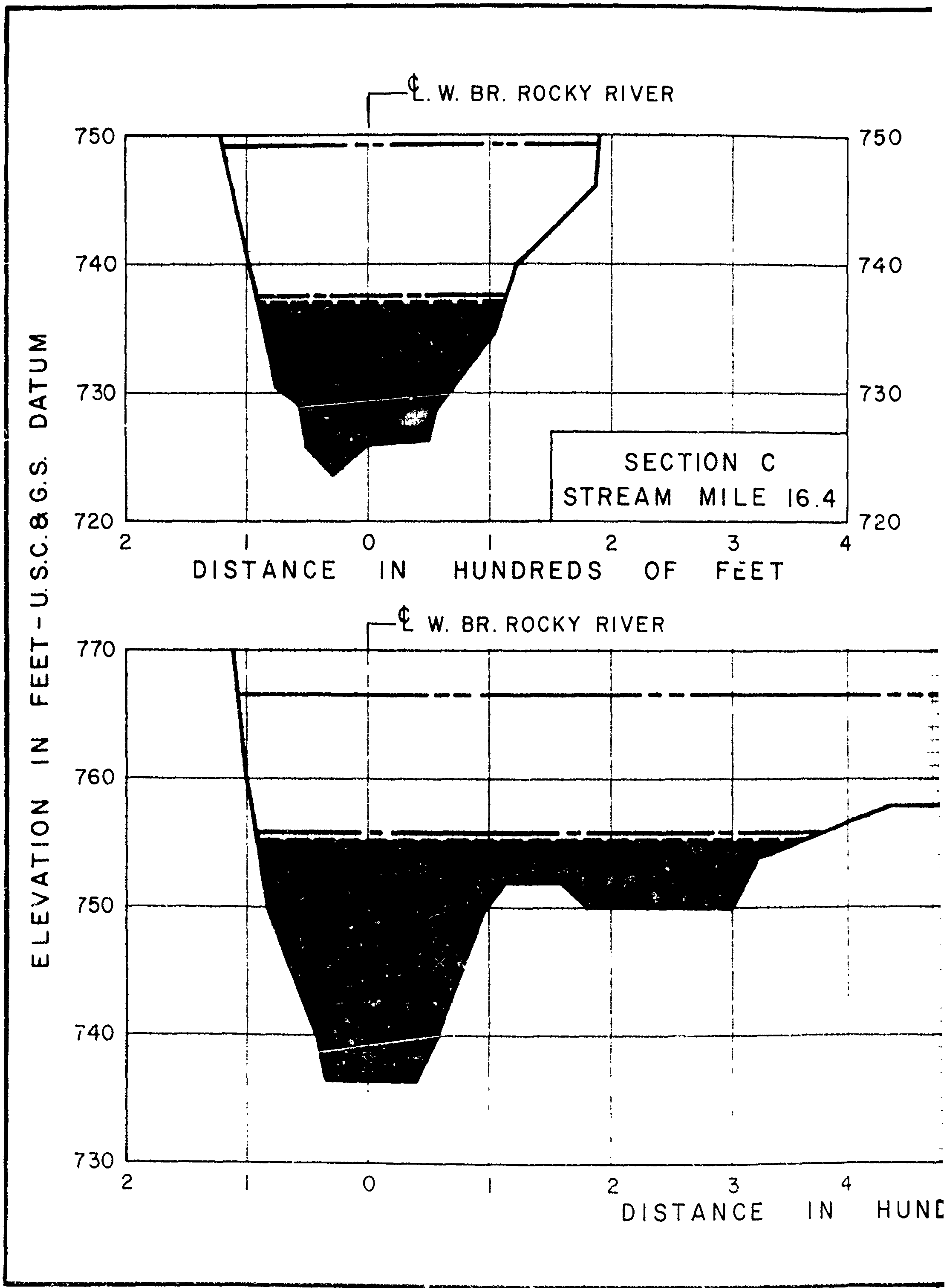
APPROXIMATE GROUND SURFACE

NOTES:

VALLEY CROSS SECTIONS ARE BASED ON ACTUAL FIELD SURVEYS AND U.S GEOLOGICAL SURVEY QUADRANGLE MAPS.

VALLEY CROSS SECTIONS ARE LOOKING DOWNSTREAM AND ARE LOCATED ON PLATE 5.

WEST BRANCH ROCKY RIVER
CUYAHOGA & LORAIN COUNTIES
OHIO
FLOOD PLAIN INFORMATION REPORT
VALLEY CROSS SECTIONS
A AND B
U. S. ARMY ENGINEER DISTRICT, BUFFALO
FEBRUARY 1971



℄. W. BR. ROCKY RIVER
750
740
730
720
SECTION C
STREAM MILE 16.4
2
1
0
1
2
3
4
DISTANCE IN HUNDREDS OF FEET
℄ W. BR. ROCKY RIVER
770
760
750
740
730
ELEVATION IN FEET - U.S.C.& G.S. DATUM
DISTANCE IN HUND

LEGEND:

STANDARD PROJECT FLOOD

INTERMEDIATE REGIONAL FLOOD

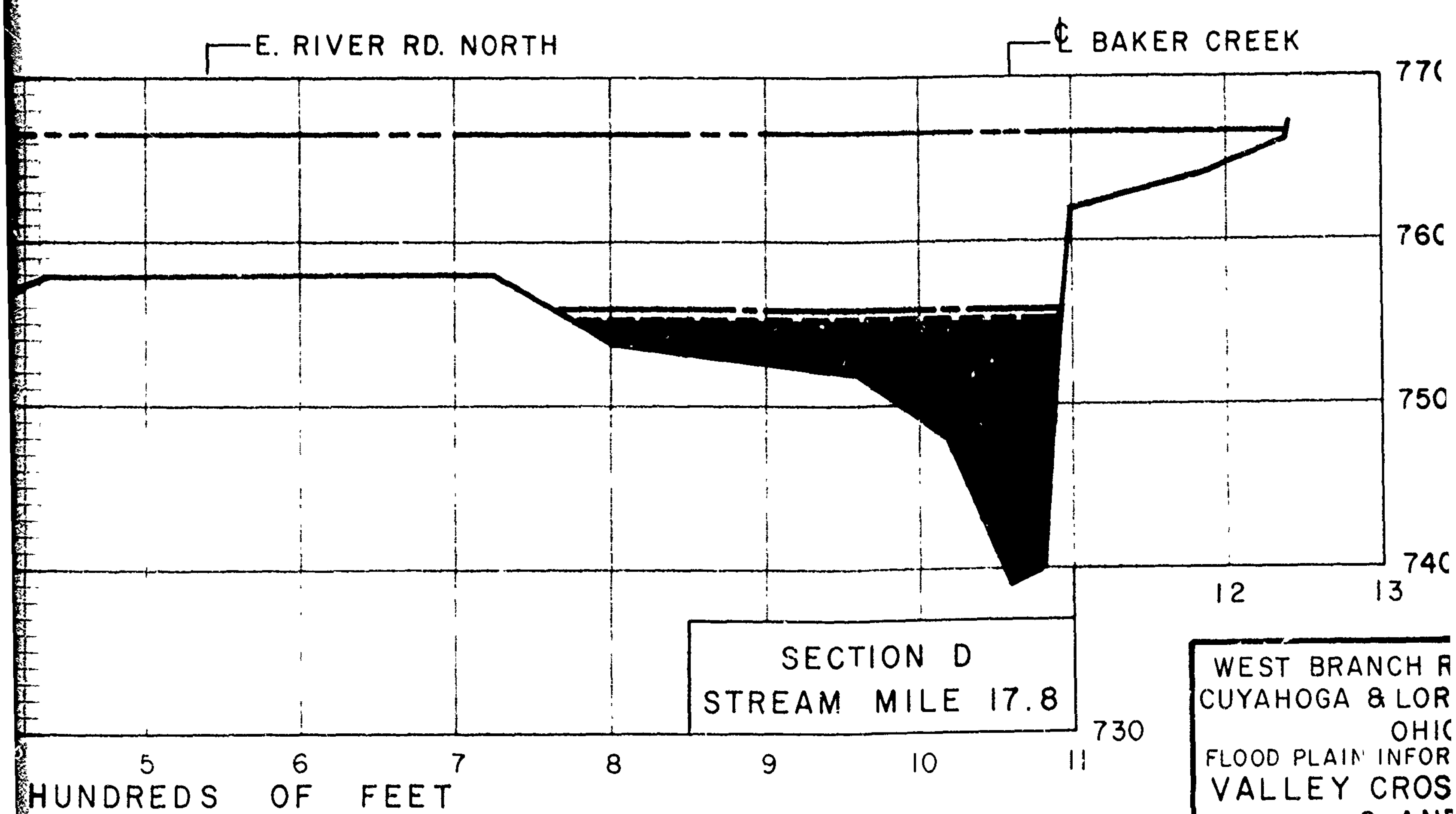
JANUARY 1959 FLOOD

APPROXIMATE GROUND SURFACE

NOTES:

VALLEY CROSS SECTIONS ARE BASED ON ACTUAL FIELD SURVEYS AND U.S. GEOLOGICAL SUR QUADRANGLE MAPS.

VALLEY CROSS SECTIONS ARE LOOKING DOWN STREAM AND ARE LOCATED ON PLATE 5.



WEST BRANCH R
CUYAHOGA & LOR
OHIO
FLOOD PLAIN INFOR
VALLEY CROS
C AND
U.S. ARMY ENGINEER DI
FEBRUARY

SURVEY

DOWN-

770

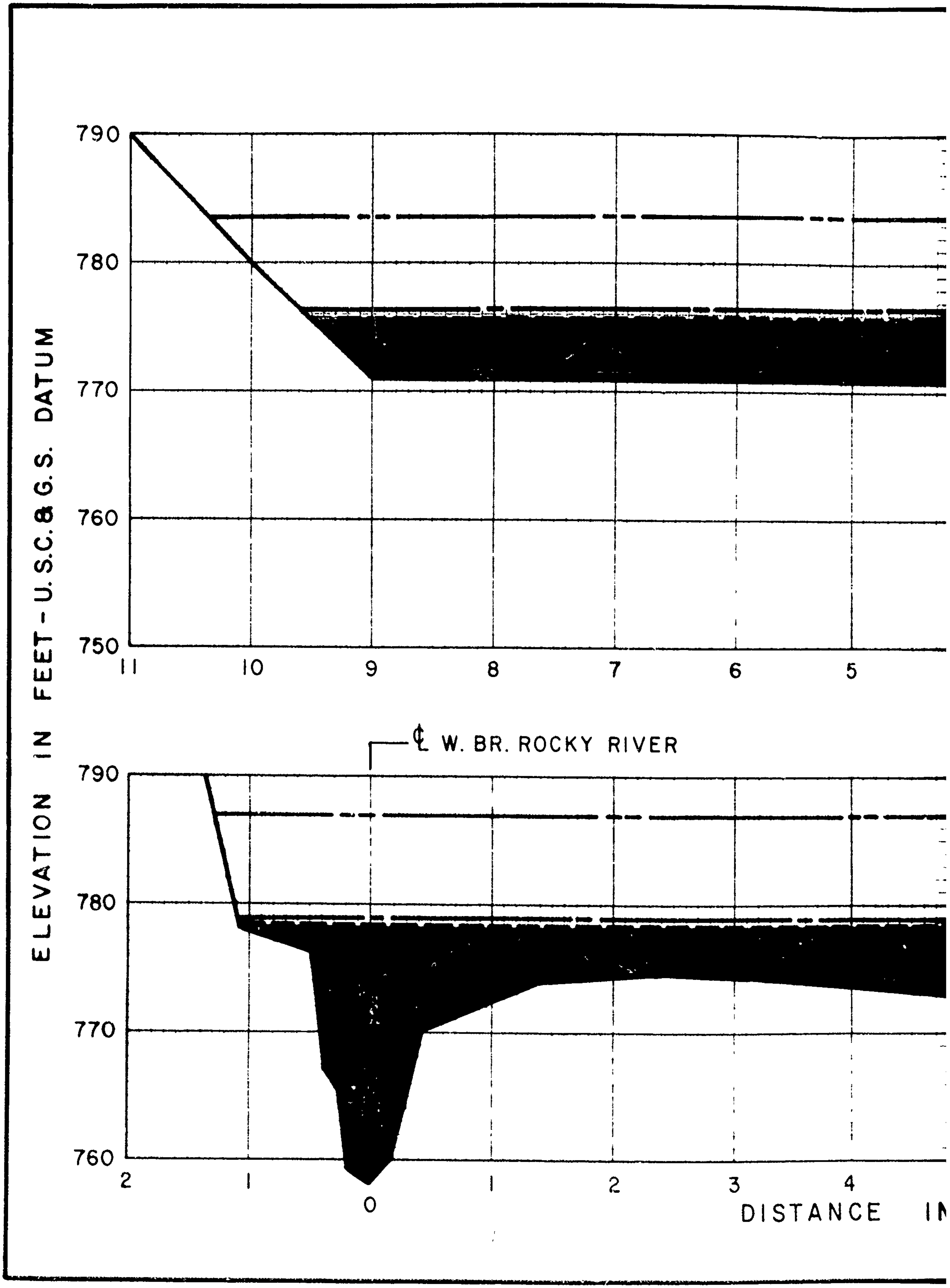
760

750

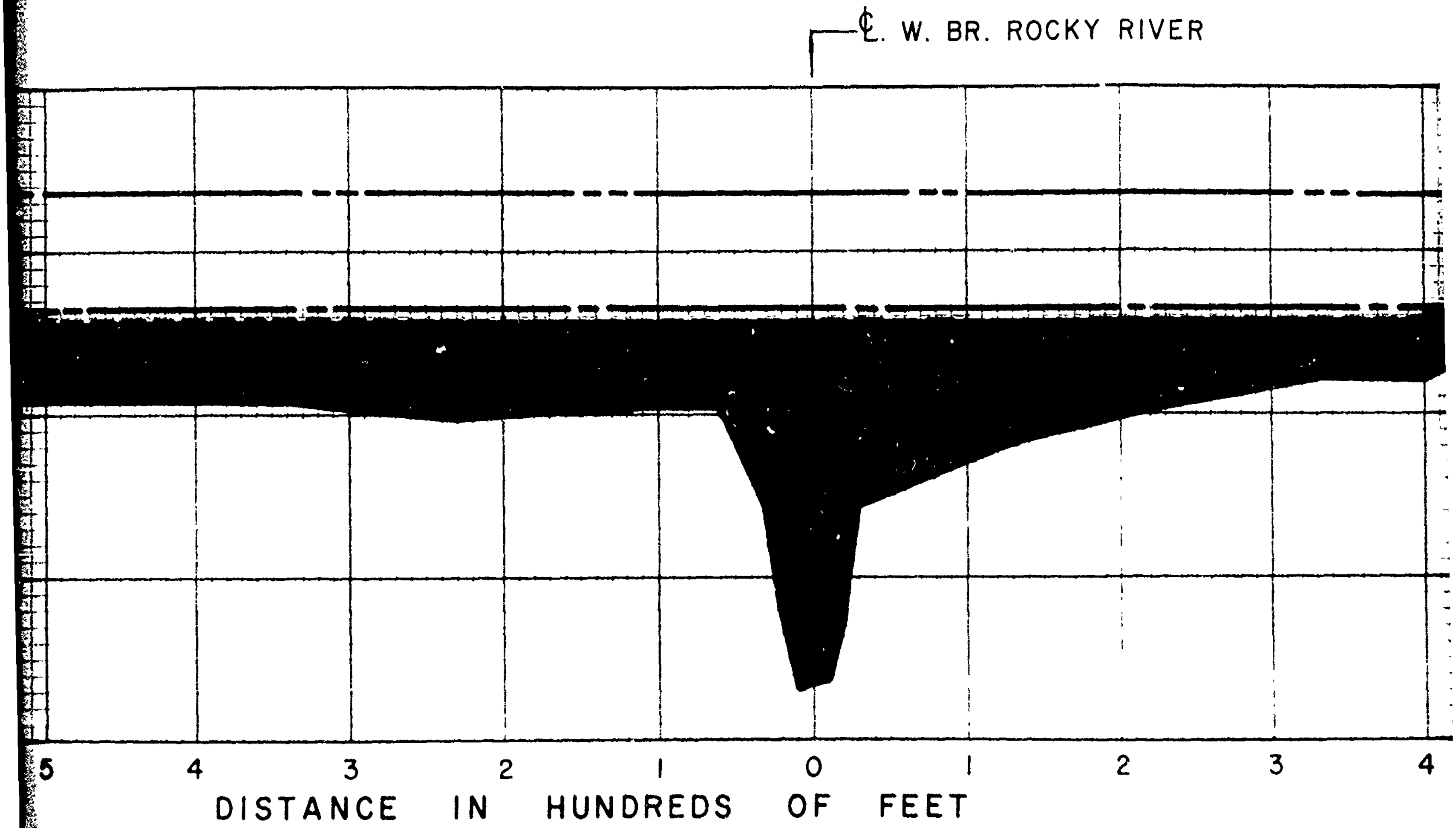
740

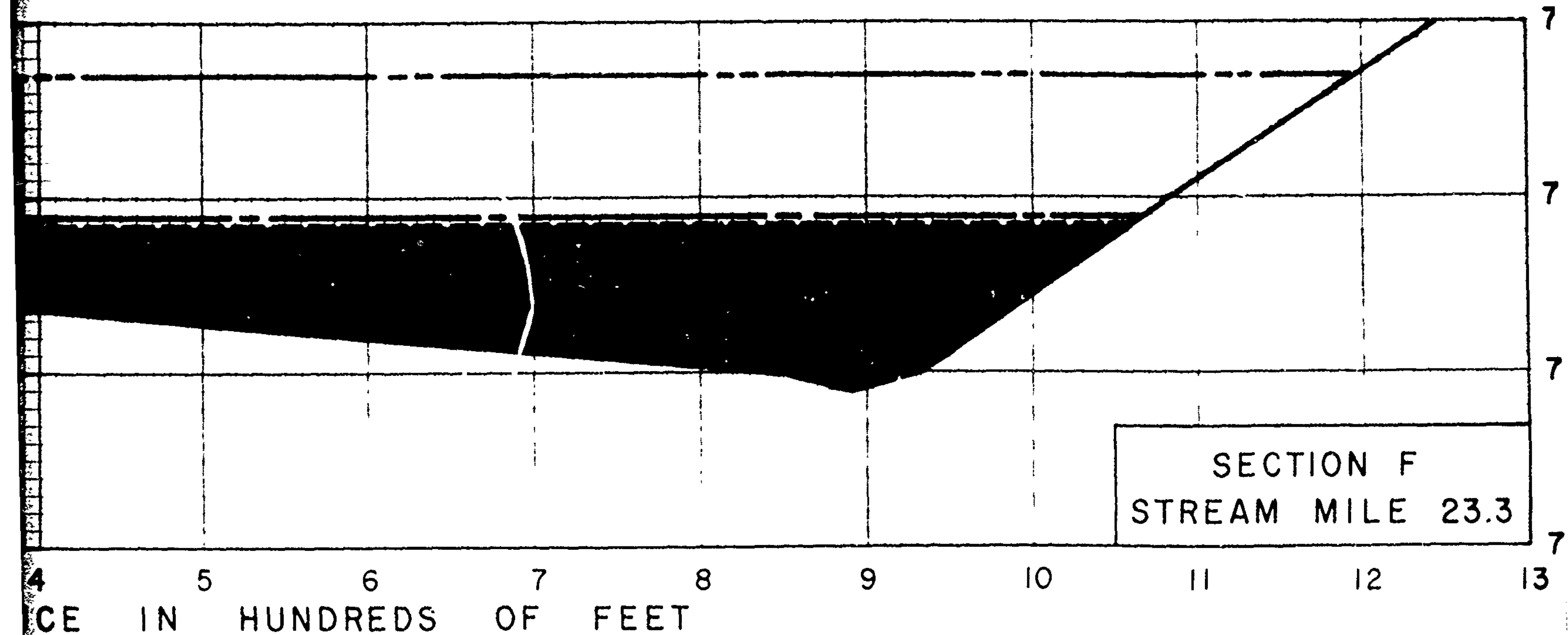
3

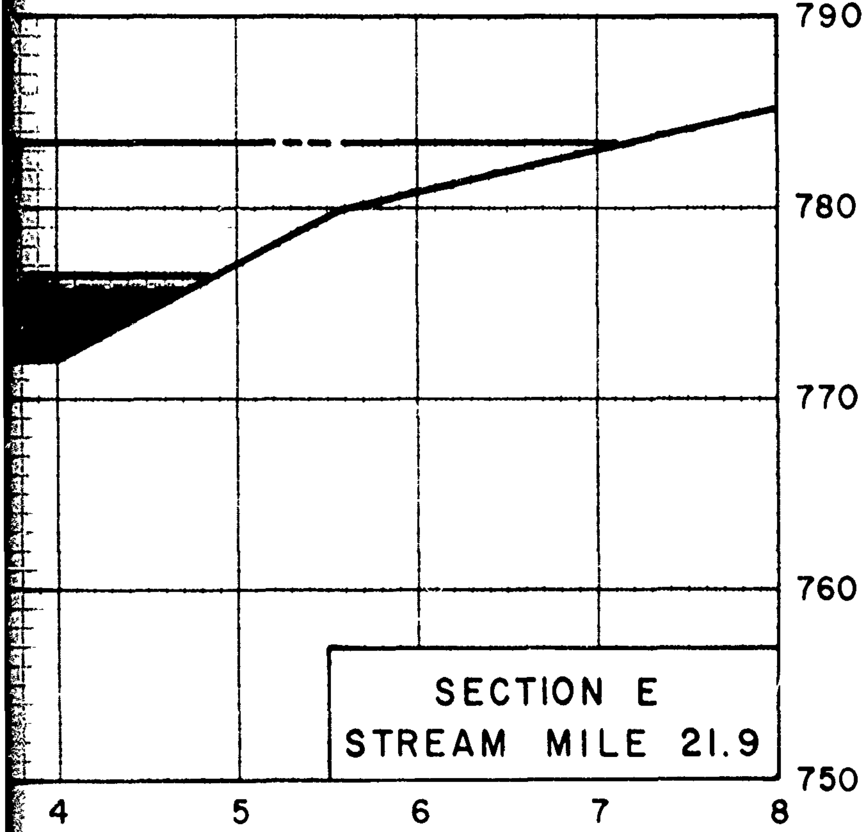
CH ROCKY RIVER
LORAIN COUNTIES
OHIO
NFORMATION REPORT
ROSS SECTIONS
AND D
ER DISTRICT, BUFFALO
UARY 1971



ELEVATION IN FEET - U.S.C.& G.S. DATUM
790
780
770
760
750
11
10
9
8
7
6
5
℄ W. BR. ROCKY RIVER
790
780
770
760
2
1
0
1
2
3
4
DISTANCE IN


℄. W. BR. ROCKY RIVER
5 4 3 2 1 0 1 2 3 4
DISTANCE IN HUNDREDS OF FEET


7
7
7
7
SECTION F
STREAM MILE 23.3
4 5 6 7 8 9 10 11 12 13
CE IN HUNDREDS OF FEET



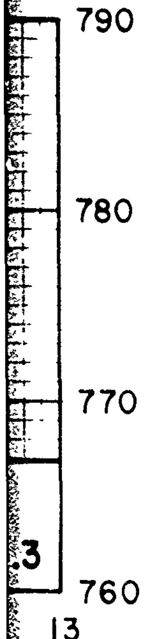
LEGEND:

STANDARD PROJECT FLOOD

INTERMEDIATE REGIONAL FLOOD

JANUARY 1959 FLOOD

APPROXIMATE GROUND SURFACE



NOTES:

VALLEY CROSS SECTIONS ARE BASED ON ACTUAL FIELD SURVEYS AND U.S. GEOLOGICAL SURVEY QUADRANGLE MAPS.

VALLEY CROSS SECTIONS ARE LOOKING DOWNSTREAM AND ARE LOCATED ON PLATE 6.

WEST BRANCH ROCKY RIVER
CUYAHOGA & LORAIN COUNTIES
OHIO
FLOOD PLAIN INFORMATION REPORT
VALLEY CROSS SECTIONS
E AND F
U.S. ARMY ENGINEER DISTRICT, BUFFALO
FEBRUARY 1971